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ABSTRACT

In recent years, many psychological constructs with associated measures have been proposed for educational research and the evaluation of educational programs. Among the most interesting and potentially useful are those reflecting motivational and volitional aspects of human behavior, the conative constructs. Among the conative constructs are achievement motivational dimensions, as well as beliefs about one's own abilities and attitudes about subject matter learning. This catalog brings together the conative constructs that seem most promising for future research and evaluation. For each construct, a brief review is presented covering construct definition, theoretical base, assessment procedures, references, and, where possible, abstracts of studies contributing to construct validation. These constructs are arranged in the following categories: (1) achievement motivation and related constructs (need for achievement, multivariate achievement motivation, achievement via conformance versus achievement via independence, intrinsic motivation, anxiety, and test anxiety/fear of failure); (2) self-regulation and related constructs (cognitive engagement and self-regulated learning, action control versus state orientation, mastery versus performance orientation, mindfulness, effort avoidance motivation, self-monitoring during test performance, flow, and future time perspective); (3) interests and styles in learning (individual interest, situational interest/text-based interest, content motivation, learning styles, and motivated strategies for learning); (4) self-related constructs (self-concepts, perceived self-efficacy, and personal agency beliefs); and (5) other-related constructs (persuasibility, conceptual structure, alternative conceptions, and qualitative cognitive change). One figure is included. (SLD)

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Project 2.3: Enhancing the Utility of Performance Assessments: Domain Independent R&D

Assessment of Conative Educational Processes and Outcomes

Assessment of Conative Constructs for Educational Research and Evaluation: A Catalogue

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Stanford University

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ASSESSMENT OF CONATIVE CONSTRUCTS FOR EDUCATIONAL RESEARCH AND EVALUATION: A CATALOGUE

Richard E. Snow and Douglas N. Jackson
Stanford University

INTRODUCTION

In recent years, a plethora of psychological constructs and their associated measures have been proposed for attention in educational research and in the evaluation of educational programs; some may have even been advocated for use by individual teachers with their students. These constructs are attempts to capture in one way or another, aspects of human learning and performance relevant to education that go beyond conventional constructs of cognitive aptitude and achievement. Some are quite new, with relatively little foundation in prior programmatic research. Some are old concepts in psychology that have not received much attention, especially in contemporary educational work. Many are designed to identify potentially important individual differences among students that influence learning in instructional situations. Most also can be used to assess outcomes from such learning.

Among the most interesting and potentially useful of these constructs are those reflecting motivational and volitional aspects of human behavior; we call these "conative constructs." There are of course important "cognitive" constructs. There are also many new "affective" constructs. The distinction between cognition, conation, and affection is convenient and historically well-founded in psychology, though it should be regarded as a matter of emphasis rather than a true partition; all human behavior, especially including school learning and achievement, involves some mixture of all three aspects. But the conative side of school learning has been largely ignored in educational assessment until very recently. Among the constructs in this category are: several kinds of achievement motivational distinctions, including need for achievement and fear of failure, but also various beliefs about one's own abilities and their development, feelings of self-esteem and self-efficacy, and attitudes about particular subject-matter learning; volitional aspects pertaining to persistence, academic work ethic, will to learn, mental effort investment, and mindfulness in learning; intentional constructs reflecting control or regulation of actions leading toward chosen goals, attitudes toward the future, and self-awareness about proximal and distal goals and consequences; and many kinds of learning styles and strategies hypothesized to influence cognitive processes and outcomes of instruction. Many other more traditional personality or style constructs, such as intellectual flexibility, conscientiousness, extroversion, or reflection-impulsivity, could also be added to the list. And many of these constructs and measures may prove extremely useful in understanding student commitment to learning on the one hand, or disaffection from it on the other. Most may also be relevant to problems of aggression and other maladaptations to school life.

Unfortunately, most of the research on conative constructs in educational research has been limited to small-scale, isolated and piecemeal studies. Measures have usually been limited to questionnaires, often hastily developed and inadequately evaluated. No programmatic validational research has yet been mounted to determine what theoretical and practical distinctions and what kinds of assessments will best serve the needs of educational research, evaluation, and improvement over the long haul of educational reform in the years to come.

The purpose of this catalogue, then, is to bring together in one place those conative constructs that seem most promising as useful for future research and evaluation work in education. We also include selected constructs that are ordinarily interpreted in cognitive or affective terms but that seem to shade over into the conative domain and appear particularly useful in that regard. For each construct selected for inclusion in the catalogue, we provide a brief review covering construct definition, theoretical base, assessment procedures, references, and where possible abstracts of example studies that evaluate assessment instruments or otherwise contribute importantly to construct validation. We also discuss questions and criticisms relating to construct validation in hopes of promoting more programmatic research in this direction. Because of copyright restrictions, actual instruments are not included. But references are given to the instruments and research using them wherever possible. In many cases, instruments may be obtained by contacting authors directly. Some instruments are commercially available.

We do not here provide a comprehensive review of literature on any particular construct or on conative functions in general. For more general discussions of the problems and prospects of conative assessment in education, see Snow (1989a, 1989b, 1990), Snow and Farr (1987), and Snow, Corno, and Jackson (in press). For a review of related developments in cognitive assessment relevant to education, see Snow and Lohman (1989). For the most part, we have tried to avoid duplicating the contents of more general collections of instruments, such as the volume provided by Robinson, Shaver, and Wrightsman (1991). Many entries in that volume might be of significant value in educational research, however, so interested readers are urged not to restrict themselves to our selections.

Taxonomic Overview

It should be helpful as an overview to provide some rationale for our selection of the constructs included, and for their organization into categorical order in the catalogue. This may also help explain terminology and ultimately step toward a more standardized taxonomy for use in further research. Our categorization is admittedly rough and provisional, and in some instances rather arbitrary. However, we do see some proximities and symmetries we think worth preserving and considering further as suggestions for research, even if they are not ultimately retained in a more formal or complete theory.

Figure 1 shows our schematic taxonomy of conative constructs and its place in relation to the cognitive and affective domains. We see the conative domain as "located" in some sense between affect and cognition, and there is some theoretical justification for this from other sources (see Kuhl & Beckman, 1985, in press). We also see motivation and volition as forming a continuum, a kind of commitment pathway from wishes to wants to intentions to actions, again following other theory (Heckhausen & Kuhl, 1985). However, we do not extend this continuum to the temperament and emotion constructs of the affective domain or to the ability and knowledge constructs of the cognitive domain, which would be located in the shaded regions of Figure 1. Nor do we enter the old and continuing theoretical debates about the priority or primacy of cognitive versus affective influences (see, e.g., Izard, Kagan, and Zajonc, 1984; Lazarus, 1991; Reisenzein & Schönpflug, 1992). For the most part, we shade these domains out of consideration here. Finally, we note that conation as a category seems to include aspects of both "personality" and "intelligence." We avoid these cloudy concepts as too complex and vague for the purposes of this catalogue.

The five categories of conative constructs identified in Figure 1 are labeled with roman numerals corresponding to their place in the table of contents of this catalogue. In Section I are the various constructs of achievement motivation and anxiety. Related motivational constructs address individual differences in wishes, wants, needs, or goals, and either positive or negative expectations with respect to them. In Section II volitional, self regulatory constructs address individual differences in intentions, and the control of effort and action with respect to them. Here are constructs representing action control, effort investment and the like.

But there are also interest constructs that seem to have motivational significance in either short- or long-range connection to educational performance. The long-range, career goal interests can be omitted here, but subject-matter interests and interests in particular kinds of activities or situations should be included. There are also various learning styles that seem to reflect characteristic volitional differences. Some interest and style constructs should relate to one another, in that particular subject-matter domains seem to call for and promote development of characteristic interests and styles of work. We combine these categories into one (Section III) also for pragmatic reasons: If one omits career interest inventories research, there has been as yet little work on interest measurement.

Finally on the motivational side we locate the category of self-related constructs, self-esteem, self-efficacy, etc. (Section IV). On the volition side we form a category of other-related concepts (Section V) to include conceptions relevant to subject matter domains, persuasibility, and other qualitative changes during learning. One could include other beliefs and perceptions about instructional situations, teachers, and other students; at this point, we have not stretched this category that far.

Although as noted above, we do not address either cognitive or affective constructs formally here, each of our categories and perhaps especially Section V touches one or the other domain boundary in some way. This underscores the fuzzy character of the boundaries and reminds us that some investigators prefer cognitive interpretations of what we call volitional constructs and affective interpretations of what we call motivational constructs. So aspects of self-regulation, style and strategy, and knowledge and belief structure are often described as strictly cognitive, or metacognitive. Achievement motivation, anxiety, some interest factors and self concepts are often interpreted as temperamental dispositions. There is also sometimes a state-trait distinction in the interpretive contrast as well. We emphasize the conative aspect here because it is so often ignored. But only time and much construct validational research will show us what kinds of interpretations we are entitled to. In the interim, work on the instruments described here will at least enrich the psychological spectrum with which educational research and evaluation contends.

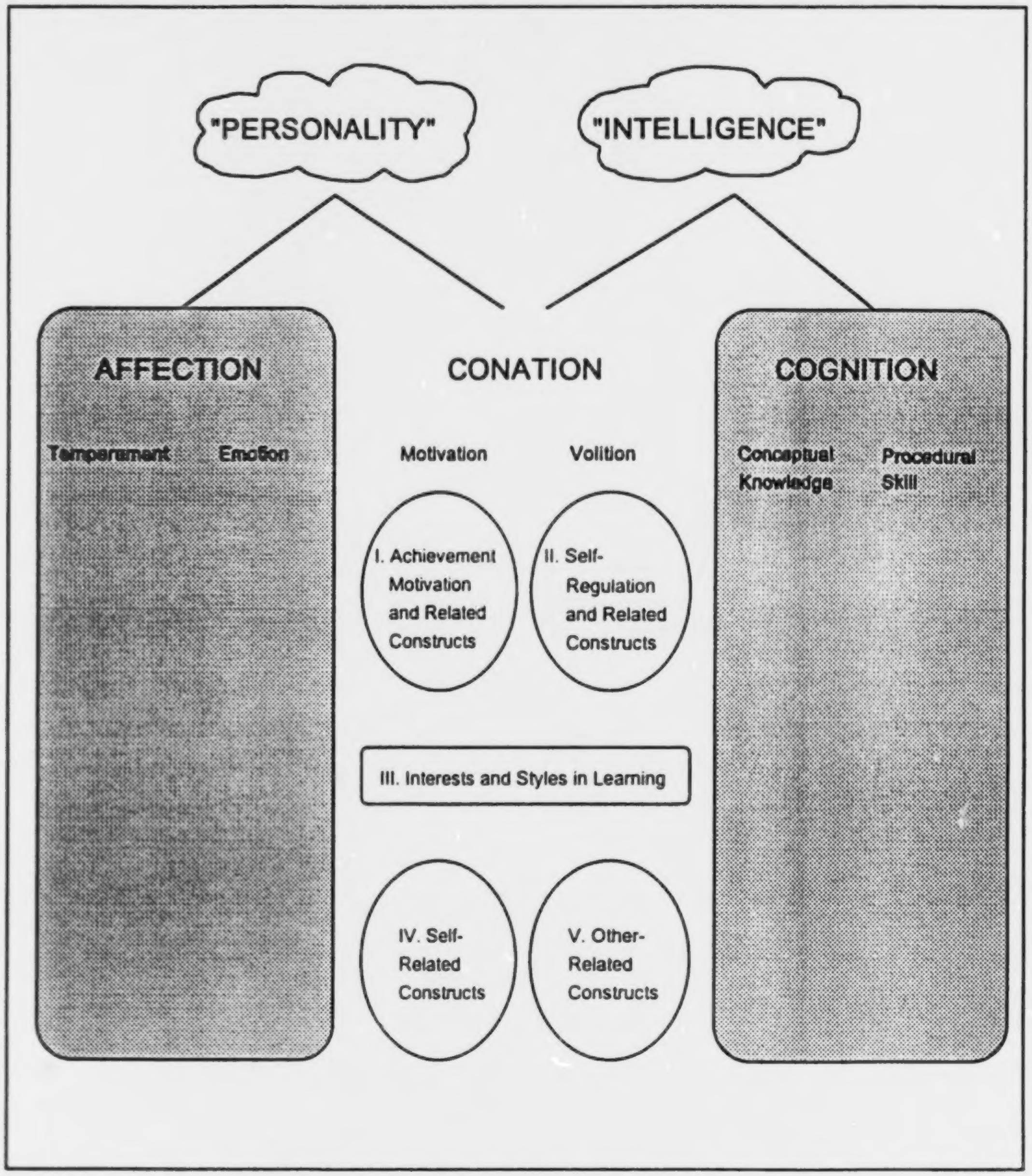
"PERSONALITY"
"INTELLIGENCE"
AFFECTION
Temperament
Emotion
CONATION
Motivation
Volition
I. Achievement Motivation and Related Constructs
II. Self-Regulation and Related Constructs
III. Interests and Styles in Learning
IV. Self-Related Constructs
V. Other-Related Constructs
COGNITION
Conceptual Knowledge
Procedural Skill

Figure 1. Provisional taxonomy of conative constructs

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I. ACHIEVEMENT MOTIVATION AND RELATED CONSTRUCTS

Title: NEED FOR ACHIEVEMENT

Definition: McClelland, Atkinson, Clark, and Lowell (1953) define need for achievement as "competition with a standard of excellence." It refers "specifically to the desire to do something better, faster, more efficiently, with less effort. It is not a generalized desire to succeed, nor is it related to doing well at all sorts of enterprises" (McClelland, 1961, p. A). The motive to achieve is considered to be distinct from acquisitiveness for money, except insofar as money is useful as a symbol of achievement, providing self-evaluatory knowledge of competence to the achiever. Consequently, an individual high in need for achievement would seek an occupation in business because such occupations are thought to provide both moderate challenge and sufficient competition against which to measure success (Jackson, Ahmed, & Heapy, 1976).

Constituent and Related Constructs:

McClelland et al. have found it useful to distinguish between two types of motivation: ***fear-of-failure(FF)*** and ***hope-of-success (HS).*** Some individuals are primarily motivated to avoid failure, while others are primarily motivated to achieve success. While both types of motivation can lead to effort and success, the two types differ in the kinds of risks they prefer to take. Those seeking success choose moderately difficult tasks where the payoff is also moderate. Those wishing to avoid failure choose either easy, low-payoff tasks where failure is unlikely, or very difficult, high-payoff tasks where failure is so probable that it is expected. Other measures derived from fear of failure and hope of success are ***net hope (HS - FF)*** and ***total motivation (HS + FF).***

Theoretical Base:

In the late 1940s, the prevailing view was that complex human motivational phenomena could be explained by an analysis of primary needs (such as hunger) in animals. But psychologists influenced by Murray had accumulated a corpus of data on complexities of human motivation that seemed difficult to account for by reference to the basic organismic factors. Atkinson and McClelland (1948) sought a new approach to the study of human motivation that went beyond the reductionism of the time (Heckhausen, H., Schmalt, H.-D., & Schneider, K., 1985). They decided to use Murray et al.'s (1938) Thematic Apperception Test (TAT) to investigate human motives. The TAT is a projective test consisting of ambiguous pictures that serve as the stimuli about which subjects generate stories. The stories are then scored for a particular theme.

Atkinson and McClelland (1948) believed that if a person is motivated to achieve a particular goal, then thoughts concerning that motive should be readily accessible in the person's memory and should be reflected in their scores on the TAT. Although the TAT had already been used in clinical work, evidence for its validity and theoretical viability was weak. Atkinson and McClelland (1948) first successfully demonstrated the validity of the TAT as a measure of need for food in a food deprivation experiment. Next, they sought to validate the

TAT as a measure of experimentally induced need for achievement. In further studies, McClelland and his colleagues investigated individual differences in need for achievement, guided by the Lewinian notion that achievement behavior could be influenced by characteristics of both the person and the environment (B = f(P,E)).

Assessment Procedure:

Assessment of need for achievement is accomplished primarily through McClelland et al.'s adaptation of the Thematic Apperception Test (TAT). The TAT is scored for hope of success (HS) and fear of failure (FF); two other derived measures, net hope (HS - FF) and total motivation (HS + FF) are sometimes used. Another measure of the same variables was devised by Schmalt (1976) called the Achievement-Motive Grid (LMG).

Numerous questionnaire measures have been designed to measure need for achievement, and several of these are discussed in the next catalogue entry entitled "Multivariate Achievement Motivation." Proponents of TAT procedures (e.g., McClelland, 1972; McClelland, Koestner, & Weinberger, 1989) argue that the TAT more validly measures different aspects of achievement motivation than do questionnaire procedures. Proponents of questionnaires dispute the reliability and validity of TAT procedures and cite the general concerns about projective assessment techniques that are elaborated below. In a meta-analysis of 105 randomly selected empirical research articles, Spangler (1992) sought to compare TAT and questionnaire measures. Spangler found that:

> the correlations between TAT measures of need for achievement with outcomes were on average positive; that these correlations were particularly large for outcomes such as career success measured in the presence of intrinsic, or task-related, achievement incentives; that questionnaire measures of need for achievement were also positively correlated with outcomes, particularly in the presence of external or social achievement incentives; and that on average TAT-based correlations were larger than questionnaire-based correlations. (p. 140)

Thus, Spangler found an interaction between the type of measure (TAT vs. questionnaire) and the environmental stimuli (task-related vs. social achievement incentives). Furthermore, Spangler found a low correlation of .088 between TAT and questionnaire measures of need for achievement. These results support the notion that TATs and questionnaires are measuring different aspects of personality, and that they both may be valid measures of achievement motives. However, Spangler did not discuss the nature of the questionnaire measures of achievement motivation included in the studies of the meta-analysis. The meta-analysis compared validities from TAT measures to validities obtained from what must be a diverse set of questionnaire measures of variable reliability and test construction standards. The correlations between questionnaire measures and achievement outcomes might well have differed depending on the particular questionnaire measures used in the studies.

Issues for Construct Validation:

1. The use of projective assessment techniques has been questioned on a number of grounds (Anastasi, 1976; Weinstein, 1969):

   a) Subtle differences in the phrasing of verbal instructions and examiner-examinee relationships can appreciably alter test performance.

   b) Scoring projective instruments depends on the skill and experience of the examiner, and limits the comparability of scores derived by different experimenters. Furthermore, the test may be as projective for the examiner as it is for the examinee.

   c) Normative data are often inadequate or unavailable.

   d) Coefficients of stability and internal consistency have usually been low. With short intervals, the test may show no more than recall of the original responses. With long intervals, retest reliability is subject to large chance effects.

   e) The large majority of validation studies of projective techniques contain severe procedural deficiencies in either experimental controls or statistical analysis, or both (Anastasi, 1976). Some of these methodological deficiencies have led to spurious evidence of validity through criterion or test data contamination.

   f) The fundamental projective hypothesis, that responses to ambiguous stimuli reflect stable and enduring personality constructs has been questioned in light of the significant body of research that indicates other factors can affect an individual's projective responses.

   g) Projective test performance may be influenced by the respondent's ability. High ability respondents may generate richer and more interpretable stories in response to projective stimuli.

   h) The variability in lengths of the stories generated by different respondents can confound TAT scoring.

   i) Although the TAT is still widely used to measure need for achievement, little is known about the processes that underlie responses to it and other projective measures.

2. Need for achievement scores derived from the TAT do not show convergent validity with objective measures of achievement motivation. McClelland (1951; 1980) argues that only the TAT will yield valid motive scores; objective questionnaires yield valid measures of attitude, values, aspirations, schemas and traits, but not motives. Does the TAT measure

something that is not measured by objective questionnaires, or is the lack of convergent validity an indication of an inadequate construct?

3. Heckhausen (1968; 1986) has pointed out that the domain specificity of an individual's achievement strivings is poorly understood: "What we measure is intensity, not extensity of a motive."

4. The fear-of-failure motive may itself be a multidimensional construct (Heckhausen, 1986). One facet of fear of failure is coping and approach-oriented, the other is fearful and avoidant (e.g., Dweck & Leggett, 1988).

5. Fear-of-failure has usually been operationalized as test anxiety. But does test anxiety adequately comprise fear-of-failure. Test anxiety is an indication of the self-perception of low or inadequate ability (Nichols, 1984). To what extent is fear-of-failure contaminated with perceptions of low ability?

6. Need for achievement and test anxiety have both been shown to give curvilinear relation to educational achievement, as theory predicts (Lens, 1983). Yet little research has pursued analysis of these relations. Most studies include only one of these constructs and assume linear relations (Rand, Lens, & Decock, 1989).

7. What are the roles of social processes in achievement motivation? Fear of failure is often measured by items that address "fear of public knowledge of failure." In Atkinson's definition of the achievement motive, the self-evaluative emotions of pride and shame are related to high and low effort attributions. But there are further distinctions that can be made here, for instance, between public shame and a personal sense of shame or guilt.

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Example Study Abstracts:

1. Weinstein, M.S. (1969). Achievement motivation and risk preference. *Journal of Personality and Social Psychology, 13*, 153-172.

   Determined relationships among 8 measures of the need for achievement and 12 measures of risk preference, and empirically tested the J. W. Atkinson risk-taking model involving relationships between the measures. 198 undergraduate males were administered a battery of measures over a 4-wk period. Analysis of the data revealed: (1) low nonsignificant correlations among need for achievement measures, (2) extremely poor reliability (both internal consistency and test-retest) for traditional need for achievement measures, (3) low convergence across risk preferences in a variety of contexts, and (4) confirmation of the Atkinson model only for risk preferences in vocational choices. Factor analyses of both need for achievement and risk-preferences measures provided evidence of the multidimensional nature of these constructs. Results indicate that the several need for achievement indexes do not measure the same thing and must not be used interchangeably.

2. Heckhausen, H. (1978). Self-evaluation after performance progress contrary to expectations: Influence of motive, causal attribution, and goal setting. *Zeitschrift fur Entwicklungspsychologie und Padagogische Psychologie, 10*, 191-216. Language: German.

   79 adults (Exp I) and 84 10-13 yr-olds (Exp II) were divided into Hope of Success (HS) and Fear of Failure (FF) groups according to their performance on the TAT. Ss reached a 50% success level on a signal recognition task, then unexpectedly experienced a series of successes or failures. As predicted, self-ascribed ability generated more positive affects after success than did effort. After failure, dissatisfaction was less the more Ss had ascribed to themselves lack of effort and not lack of ability. In the young FF-group, this relationship turned out to be reversed, resembling the known pattern of evaluation by others. Attribution effects were stronger than goal discrepancy effects. Results support a motive construct that is conceived of as a self-reinforcing system.

3. Rest, S., Nierenberg, R., Weiner, B., & Heckhausen, H. (1973). Further evidence concerning the effects of perceptions of effort and ability on achievement evaluation. *Journal of Personality & Social Psychology, 28*, 187-191.

   Reports 3 experiments based on the findings of B. Weiner and A. Kukla (see Dissertation Abstracts, vol. 44:12575) that perceived effort expenditure and ability level in addition to achievement outcome, are determinants of reward and punishment in achievement-related contexts. In Exp I 32 male and female undergraduates served as Ss in a simulated teaching experiment. Results demonstrate that the trait of diligence, as well as high effort expended on a particular task, enhances rewards from others. In Exp II, with 81 Swiss school teachers, perceived task difficulty was manipulated by varying task instructions. It was found that the perceived difficulty of a test does not influence the rewards and punishments dispensed as a function of perceived effort expenditure and level of ability. In Exp III 216 undergraduates made judgments about hypothetical students in all experimental conditions. It was suggested that prior findings indicating that low ability is relatively rewarded may be mediated, in part, by inferences of compensatory effort.

4. Kuhl, J. (1978). Standard setting and risk preference: An elaboration of the theory of achievement motivation and an empirical test. *Psychological Review*, *85*, 239-248.

   Proposes an elaboration of J. W. Atkinson's (1957) theory of achievement motivation to include standard setting as a determinant of risk preference and motivational tendency. When the personal standard is located at an intermediate level of task difficulty, the elaborated theory reduces to the original theory. In Ss having a motive to achieve success higher than the motive to avoid failure, a shift of the peak of the preference function is predicted from moderately difficult to more difficult tasks if the standard is more difficult and to easier tasks if the standard is easier. In failure-oriented Ss, an inverse relation between difficulty of standards and preferred difficulty level is predicted. Experimental results from 32 undergraduates confirm these predictions. It is concluded that some of the inconsistent findings concerning the preference functions of success-oriented or failure-oriented Ss can be explained by individual differences in personal standards of excellence.

Title: MULTIVARIATE ACHIEVEMENT MOTIVATION

Definition: There is now evidence that achievement motivation is comprised of several different constructs beyond McLelland et al.'s original two: hope for success and fear of failure (Jackson, Ahmed, & Heapy, 1976). Ray (1982) reports on over 70 achievement measures. Projective and objective measures of achievement motivation are often uncorrelated (e.g., Spangler, 1992; Weinstein, 1969). Sometimes different measures of achievement motivation seem to be linked by little more than the use of the word "achievement" in their descriptors. This entry attempts to describe the various achievement motivation constructs. Achievement via independence and achievement via conformance are described in more detail in a later entry, and are only briefly described here.

Constituent Constructs:

From Jackson, Ahmed, & Heapy (1976):

1. ***Status with experts.*** This construct measures motivation associated with the rewarding aspects of striving for social recognition with experts.
2. ***Acquisitiveness.*** This scale measures motivation based on the reinforcing properties of material rewards.
3. ***Achievement via Independence*** Achievement via independence is a motivation to do well in tasks and environments where individual initiative is rewarded.
4. ***Status with peers.*** This construct measures motivation associated with the rewarding aspects of striving for social recognition with one's peers.
5. ***Competitiveness.*** Individuals with high scores on this construct enjoy competing with others in order to win.
6. ***Concern for excellence.*** This construct has been defined by McClelland et al. (1953) as "competition with a standard of excellence." It measures the reinforcing properties of doing one's best.

Theoretical Base:

Following McClelland et al.'s (1953) work with the TAT, there were many attempts to devise self-report achievement measures that were easier to administer and score and more reliable than the TAT. Many of these measures were constructed by combining items according to the test author's intuitions, but without explicit reference to the theory of achievement motivation (Heckhausen, Schmalt, & Schneider, 1985). Here we discuss constructs from three of these attempts that are exceptional because the measures they use were derived theoretically and because construct validation work has attempted to clarify the relationships among the constructs they embody.

Other perspectives on achievement motivation could also be included here. For example, attribution theory offers another approach to the analysis of achievement motivation (Weiner, 1986). Although current work in the line ignores individual differences for the most part, there have been attempts to develop usable assessment instruments from this perspective. A main example is the work of Anderson (1983) who developed an "Attributional Style Assessment Test."

In a similar vein, Nicholls, Patashnick, and Nolen (1985) examined high-school students' perceptions of the causal attributions related to school success. For example, students who believed that school should enable them to enhance their wealth and status were less likely to be committed to learning for its own sake than students who believed schools should teach commitment to society, understanding of the world, or teach high standards and achievement-related behaviors. Nicholls et al.'s work is important because it links students' personal goals with their educational ideologies and causal attributions for success. See also Ford and Ford (1987) and Ford and Thompson (1985) regarding personal goals and personal agency beliefs.

Assessment Procedures:

Ray (1982) reports on over 70 self-report measures of achievement motivation, with highly variable reliability and validity. Below we discuss a few theoretically derived measures that have been included in construct validational studies.

1. Mehrabian's (1968, 1969) Resultant Achievement Motivation Test (RAM) was developed as a measure of the tendency to achieve. The RAM was designed to reflect a variety of behaviors and experiences that are theoretically relevant to McClelland et al.'s (1953) achievement motivation. The degree to which respondents endorse alternatives characteristic of success- and failure-motivated persons yields a measure of the "resulting tendency" of achievement motivation. The RAM consists of male and female versions of the questionnaire, although some researchers (e.g., Morris & Snyder, 1978) have revised the sex-specific items to represent genderless stimulus situations so that the same form could be used for both sexes.

2. Herman's (1970) Presatie Motivatie Test (PMT) is a measure of achievement motivation developed by constructing a large item pool based on an empirical and theoretical consideration of 10 aspects of the achievement motive. The following description was used to guide item writing (Herman, 1970, p. 355):

    (a) The achievement-motivated individual has a high-aspiration level in so far that it does not reach beyond his capacities;
    (b) He prefers high probabilities when the outcome of an action is highly determined by external factors such as chance;
    (c) He has a strong striving for upward mobility;
    (d) He persists for a long time when confronted with a task of intermediate difficulty;
    (e) When interrupted while working at a task he wants to accomplish, he has a strong tendency to resume the task;
    (f) He has a dynamic time perception and feels things are happening quickly;

(g) His time perspective is very much future oriented;
(h) His choice of a task partner is primarily directed by the competence of the other;
(i) He seeks recognition by performing well in his work; and
(j) He likes to perform well.

Morris and Snyder (1978) reported a study that administered Herman's (1970) PMT with Mehrabian's (1968, 1969) RAM, and the Achievement via conformance (Ac) and Achievement via independence (Ai) scales of the California Psychological Inventory (Gough, 1964) to 66 undergraduate business majors. Achievement via independence is a motive to succeed in tasks and environments where individual initiative is rewarded, whereas Achievement via conformance (Ac) refers to a motive to succeed when tasks and environments are well defined. Results indicated that Mehrabian's RAM was correlated (r=.44) with Herman's PMT and with Ac (r=.29) but not correlated with Ai (r=.05). The PMT correlated with both Ac (r=.40) and Ai (r=.47). Morris and Snyder experimented with several a priori scoring procedures for the PMT that differed from the standard procedures, and these dramatically changed the relationships observed among the measures.

Mehrabian (1968), in a study of 108 males and 109 females, reported correlations of .28 between male RAM scores and the TAT, and correlations of .17 between female RAM scores and the TAT. In the same samples, male RAM scores were correlated .64 with Rotter's (1966) internal-external control scale and -.18 with Crowne and Marlowe's (1960) social desirability scale. Female RAM scores correlated .41 with internal external control and .00 with the social desirability scale.

Jackson, Ahmed, and Heapy (1976) sought to explore the multidimensional nature of achievement motivation using a multitrait multimethod design. Following a conceptual analysis of the achievement construct, they postulated six distinct dimensions of achievement. Five methods of measuring each construct were devised: Self-Rating, Personal Description, Internation Simulation, Adjective Checklist, and Personality Questionnaire. After administration to 155 subjects, the 30 measures were incorporated into a multitrait-multimethod matrix. Substantial evidence of the heteromethod convergent and discriminant validity for each of the six facets of achievement was obtained. Three second order factors were revealed by a second order factor analysis: Competitive Acquisitiveness, Status, and Excellence. Cassidy and Lynn (1989) report a multidimensional achievement motivation scale based on the Jackson et al. (1976) work and that of others.

The emergence of acquisitiveness as distinct from achievement is important because it stands in contrast to McClelland (1961, p. 47) who views wealth as a symbol of achievement and secondary to achievement. Jackson et al.'s (1976) work suggests that achievement and acquisitiveness do not necessarily covary. Furthermore, Jackson et al. and Atkinson have slightly different views on the nature of achievement behavior. According to Jackson et al. (1976), achievement behavior is "the resolution of the six primary vectors interacting with a given situation" (p. 19), whereas Atkinson views achievement-oriented behavior as the resultant of hope for success minus fear of failure plus various extrinsic influences.

Issues for Construct Validation:

1. In light of the Jackson et al.'s research suggesting that achievement motivation is a multidimensional construct, it does not seem to make sense to say "Bill is high in achievement motivation" without also asking "What kind of achievement motivation is Bill high in?" What are the implications of high competition with a standard of excellence in the face of low acquisitiveness (or the reverse)? (Jackson et al., 1976)

2. Ray (1982) reported on over 70 self-report measures of achievement motivation. To what extent are research findings concerned with achievement motivation understandable and comparable in the face of so many operationalizations of the construct(s).

3. Kuhl's work and the distinction between motivation ("choosing") and volition ("acting") suggest a means of examining the processes underlying observed differences in achievement motivation, at least for particular domains. How might an understanding of achievement motivation at the process level be pursued?

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Title: ACHIEVEMENT VIA CONFORMANCE VS. ACHIEVEMENT VIA INDEPENDENCE

Definition: Another approach to subdividing achievement motivation is to separate ***Achievement via conformance (Ac)*** from ***Achievement via independence (Ai).*** Achievement via conformance (Ac) refers to a drive to do well when tasks and environment are well defined. A high Ac is described as capable, efficient, organized, responsible, and sincere. In contrast, Achievement via independence is a drive to do well in tasks and environments where individual initiative is rewarded. The high Ai is described as mature, foresighted, demanding, and self-reliant. Factor analytic studies tend to group the Ac and Ai scales with other CPI scales to create other general personality constructs.

Assessment Procedures:

These achievement constructs have been measured by scales on the California Psychological Inventory (CPI), a self-report personality inventory developed using items from the MMPI. The CPI is a well-known inventory that has been subjected to extensive research. Most of the scales on the CPI were developed empirically by selecting items that distinguished between groups. For example, achievement via conformance (Ac) was developed using successful high school students as the criterion group, while achievement via independence (Ai) was developed as a scale distinguishing successful university students. Scales such as Ac and Ai were not derived through a conceptual analysis of the achievement domain because the CPI was developed using empirical item keying.

Theoretical Base:

Ac and Ai have been included in several empirical Aptitude-Treatment-Interaction studies designed to test whether students who are high Ac or Ai would be more successful when presented with college instruction that was structured and demanding of conformity versus instruction that emphasized student initiative and independence, respectively (Domino, 1968; 1971). In both studies, better student work was produced when the instructor's teaching was matched to the student. High Ac's did better with formal instruction, and high Ai's excelled when allowed initiative and self-direction.

Other studies at the high school level (Peterson, 1976; Porteus, 1976; see Snow, 1977, for a summary) have confirmed the importance of the Ai-Ac distinction and its relation to achievement in these different instructional situations. Furthermore, the two measures seem unrelated to ability or anxiety.

Issues for Construct Validation:

1. The Ai and Ac scales have been studied in broad-based factor analyses and in some aptitude-treatment interaction designs. But they have not been subjected to more detailed analyses in relation to other achievement motivation constructs. Beyond the Jackson,

Ahmed, and Heapy (1976) results, there is not much evidence that links these constructs into a network.

2. The majority of CPI scales intercorrelate above .50, implying that care must be taken when interpreting the meaning of scores on these individual scales.

3. To what extent have response styles such as social desirability and acquiescence confounded validity studies of achievement motivation. These response styles have been shown to be correlated with intelligence (Jackson & Pacine, 1961) and are often among the first factors extracted in analyses of personality measures.

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Title: INTRINSIC MOTIVATION

Definition: A person engages in tasks and activities that are intrinsically motivating for their own sake, not to receive some external reward or avoid some negative consequence. "Intrinsically motivated learning is learning that occurs in a situation in which the most narrowly defined activity from which the learning occurs would be done without any external reward or punishment" (Malone & Lepper, 1987).

Constituent and Related Constructs:

1. ***Interest***

2. ***Interestingness/Text-based interest***

3. ***Content Motivation***

Theoretical Base:

Interest in the concept of intrinsic motivation was stimulated in part by White (1959), who argued that behaviors such as exploration, mastery attempts, and curiosity can be considered as an expression of an intrinsic need to competently deal with one's environment (Harter & Connell, 1984). Recent cognitive evaluation theory (Deci & Ryan, 1985) strikes a similar tone. According to Deci and Ryan, intrinsically motivated behavior is based in an individual's need to be competent and self-determining and arises from an internal locus of causality in which individuals undertake behavior for its "internal rewards," including interest and mastery. Deci and Ryan (1985) view interest as an emotional outcome or reward of intrinsic motivation. Three types of events can affect the level of intrinsic motivation:

1. Choice and positive feedback (enhances intrinsic motivation)
2. Rewards, deadlines, and surveillance (undermines intrinsic motivation)
3. Negative feedback and other events that suggest that an individual will be unlikely to attain intended outcomes (undermines intrinsic motivation)

A review by Malone and Lepper (1987) reviewed outlined the following taxonomy of intrinsic motivations, including both person and situation characteristics, to be used in the design of intrinsically motivating learning environments:

Individual Motivations:

1. Challenge
   The activity should provide a continuously optimal (intermediate) level of difficulty for the learner.

a) Goals
b) Uncertain Outcomes
c) Performance Feedback
d) Self-Esteem

2. Curiosity
The activity should provide an optimal (moderate) level of informational complexity or discrepancy from the learner's current state of knowledge and information.

a) Sensory Curiosity
b) Cognitive Curiosity

3. Control
The activity should promote feelings of self-determination and control on the part of the learner.

a) Contingency
b) Choice
c) Power

4. Fantasy
The activity may promote intrinsic motivation through the use of fantasy involvement.

a) Emotional Aspects
b) Cognitive Aspects
c) Endogeneity

Interpersonal Motivations:

1. Cooperation
The appeal of the activity may be enhanced by enlisting the motivation to cooperate with others. Endogenous cooperative motivation may be produced by segmenting the activity into inherently interdependent parts.

2. Competition
The appeal of the activity may be enhanced by enlisting the motivation to compete with others. Endogenous competitive motivation may be produced by creating an activity in which competitor's actions affect each other.

3. Recognition
The appeal of the activity may be increased if the learner's efforts receive social recognition. Endogenous recognition motivation may be produced by activities that provide natural channels for students' efforts to be appreciated by others.

Assessment Procedures:

A few scales have recently been constructed to measure intrinsic motivation:

1. The *Academic Self-Regulation Questionnaire* (Ryan & Connell, 1989) was designed for students in late elementary and middle schools. Four subscales are included, one measuring intrinsic motivation and the others measuring three forms of external motivation. The item format consists of an item stem, such as "I do my homework because..." followed by several alternatives, such as "I enjoy doing my homework" (this alternative was keyed on the intrinsic subscale).

2. The *Academic Motivation Scale* (Vallerand et al., 1989) was intended for use with college students and uses the same self-report format as used by Ryan and Connel (1989). In addition to the four scales measured by the ASRQ, the AMS also measures poor motivation for academic material.

3. The *Scale of Intrinsic vs. Extrinsic Orientation in the Classroom* (Harter, 1981) is a forced choice five-factor measure of intrinsic/extrinsic motivation including subscales for: (a) preference for challenge versus preference for easy work assigned; (b) incentive to work to satisfy one's own interest and curiosity versus working to please the teacher and obtain good grades; (c) independent mastery attempts versus dependence on the teacher; (d) independent judgment versus reliance on teacher's judgment; and (e) internal criteria for success/failure versus external criteria for success/failure. These subscales cluster and can be scored to yield variables labeled *Autonomous Judgment* and *Intrinsic Mastery Motivation*.

Issues for Construct Validation:

1. Researchers often use the terms intrinsic motivation and interest interchangeably, even though it appears that the two may be different though closely related constructs.

2. Measures used to assess the presence or degree of intrinsic motivation for a particular person and situation at a particular time need to be designed to represent the person-situation interaction character of the construct, as well as its state vs. trait aspect. More than most other achievement motivation constructs, intrinsic motivation seems more interstitial between person, situation, and time, and thus less accessible by conventional questionnaire. Given the theoretical as well as practical importance of the construct, much more extensive assessment research is needed.

3. The simple notion that making a task more intrinsically motivating will result in better learning does not always hold true (Lepper & Greene, 1978). As Lepper and Malone (1987) point out, when task or learning environment characteristics are inextricably bound to the learning activity (endogenous), increased learning is likely. When exogenous

motivational embellishments are added to make the learning environment more intrinsically motivating, they may interfere with learning. The distinction between endogenous and exogenous motivational characteristics must be kept in mind when studying intrinsic motivation or incorporating intrinsically motivating task embellishments in learning environments.

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Title: ANXIETY

Definition: Anxiety is generally described as "a state of diffuse arousal following the perception of threat, or alternatively, unresolved fear" (Epstein, 1972). Freud (1936) considered anxiety as "something felt"—a specific unpleasant emotional state or condition of the human organism that included experiential, physiological, and behavioral components.

Constituent and Related Constructs:

The term anxiety is currently used to refer to at least two, related, yet logically quite different constructs: ***state*** and ***trait*** anxiety. State anxiety is often used to describe a momentary unpleasant emotional condition that fluctuates from situation to situation and from time to time. Trait anxiety is used to describe relatively stable individual differences in anxiety-proneness as a personality trait.

Theoretical Base:

It was Freud who first proposed a critical role for anxiety in personality theory and in the etiology of psychoneurotic and psychosomatic disorders. Since then, clinical studies of anxiety have appeared in the psychiatric and psychoanalytic literature with increasing regularity, but prior to 1950 there was relatively little research on human anxiety. In factor analytic studies, Cattell and Scheier (1961) discussed the concepts of ***state*** and ***trait*** anxiety*:* Trait anxiety was defined as a unitary, relatively stable and permanent personality characteristic; state anxiety was conceptualized as a transitory condition which fluctuated over time and treatment. Spielberger (1966) further refined and clarified these two concepts. Since 1950, research on human anxiety as a characteristic symptom of modern times has been facilitated on these two fronts. Conceptual advances have clarified anxiety as a theoretical construct, and a number of scales have been created for measuring anxiety.

Assessment Procedures:

There have been two general approaches to assessing the anxiety condition. Both psychological and physiological characteristics have been employed.

1. Physiological measurements have involved such assessments as blood pressure, pulse rate, respiration rate, galvanic skin response, palm sweating, and muscular action potential.

2. Psychological measures have for the most part focused upon self-report instrumentation through inventories, scales, and questionnaires such as the following:

   a) ***Manifest Anxiety Scale*** (Taylor, 1953): Self-report scale with 65 items. It was developed by selecting items from the Minnesota Multiphasic Personality

Inventory and having them judged as to their meeting a clinical definition of chronic anxiety. Representative items were as follows: "I work under a great deal of tension," and "Life is a strain for me much of the time." Paget and Reynolds (1984) and Reynolds (1980) report normative information on a revised version of Castañeda, McCandless, and Palermo's (1956) children's form of the manifest anxiety scale.

b) ***Multiple Affect Adjective Checklist*** (Zuckerman, 1960): This self-report scale is a set of adjectives which the subject checks to describe how he or she feels. One feature of the adjective checklist is the ability to measure both the state and trait nature of anxiety as set forth by Spielberger below.

c) ***State-Trait Anxiety Inventory (STAI)*** (Spielberger, 1983): This inventory is a self-report, paper-pencil questionnaire consisting of 20 items for each dimension of anxiety with directions for answering related to a specific situation or a general condition.

Issues for Construct Validation:

1. What is the relationship between physiological and psychological measurements of anxiety? What conditions might cause the relationship between these two types of measures to be high or low?

2. The psychological measures involve self-report items and may be transparent. The items may have different meanings for each person, individuals may not know themselves well enough to respond, or they might not be willing to admit their feelings.

3. Despite the voluminous research on anxiety, the construct still defies theoretical and methodological consensus. What are the contrasting points among various theories of anxiety?

4. The consequences of anxiety are complex and interactional in nature, and depend on the demands of the situation (Snow, 1977). Although they are usually negative and debilitating, there are times when anxiety can be helpful, facilitating adaptation, adjustment, and performance (Philips, Martin, & Meyers, 1972). Measurement of anxiety might need to include items reflecting facilitating anxiety.

5. One way in which anxiety can be debilitating is by interfering with information processing resources needed for learning and performance. The mechanism by which anxiety affects information processing is not clearly understood and is deserving of further study so that interventions can be designed to help students avoid the negative effects of evaluation anxiety (Naveh-Benjamin, McKeachie, Lin, & Tucker, 1986).

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Example Study Abstracts:

1. Speilberger, C.D. (1966). Theory and research on anxiety. In C.D. Spielberger (Ed.), *Anxiety and behavior*. New York: Academic Press.

   To determine the correlation between the S-Anxiety and T-Anxiety scales under stressful and nonstressful conditions, the Form X T-anxiety was given at the beginning and at the end of a testing session in which college students were exposed to varying amounts and different kinds of experimental stress. The S-Anxiety scale was given on four occasions during the same testing session. The mean S-Anxiety scores increased under conditions of greater a priori stress and decreased under more relaxed conditions. Correlations between the S-Anxiety and T-Anxiety scales are typically higher under conditions that pose some threat to self-esteem, or under circumstances in which personal adequacy is evaluated; and correlations are lower in situations characterized by physical danger.

Title: TEST ANXIETY (FEAR OF FAILURE)

Definition: Test anxiety refers to individual differences in proneness to fear of failure in testing or evaluative situations. Test anxiety is thus regarded as synonymous with fear of failure. It is best thought of as evaluative because it is not limited to tests, but the term "test anxiety" is most widely used.

Constituent and Related Constructs:

Liebert and Morris (1967), having identified ***worry*** and ***emotionality*** as the two major components of test anxiety, define worry as cognitive concerns about the consequences of failure and emotionality as reactions of the autonomic nervous system that are evoked by evaluative stress. This evaluative stress can be associated with particular content domains or performance situations, such as learning mathematics or using computers.

Theoretical Base:

Mandler and Sarason (1952) began the study of test anxiety. They interpreted the differences in performance of high- and low-test-anxious students on the basis of learned psychological drives. Two kinds were said to be evoked by the test situation. First are task-directed drives. Second are learned anxiety drives. These stimulate two opposite and incompatible kinds of behavior: (a) task-relevant efforts to finish the task and thereby to reduce the anxiety and (b) self-directed, task-irrelevant responses, manifested by "feelings of inadequacy, helplessness, heightened somatic reaction, anticipations of punishment or loss of status and esteem, and implicit attempts to leave the testing situation" (Mandler & Sarason, 1952).

Alpert and Haber (1960) labeled the drives that lead to task-directed and task-irrelevant behaviors as facilitating and debilitating anxieties, respectively. They provided a self-report instrument, the Anxiety Achievement Test, equipped with facilitating (ATT+) and debilitating (ATT-) subscales. Sarason & Mandler devised their Test Anxiety Questionnaire (TAQ) with only a debilitating scale and inferred the presence of one anxiety from an absence of the other.

From factor analyses of the TAQ, Libert and Morris (1967) proposed that debilitating test anxiety is itself bidimensional, consisting of the components worry and emotionality. Spielberger (1980) applied the concepts of worry and emotionality to the construction and development of a self-report psychometric scale, the Test Anxiety Inventory (TAI) to measure individual differences in test anxiety. It is similar in concept and structure to A-Trait Scale of the State-Trait Anxiety Inventory.

Assessment Procedures:

Most of the measurements of test anxiety are self-report inventories or questionnaires.

1. ***Test Anxiety Questionnaire*** (Mandler & Sarason, 1952).

2. ***Anxiety Achievement Test*** (Alpert & Haber, 1960).

3. ***Worry and Emotionality Questionnaire*** (Liebert & Morris, 1967).

4. ***Test Anxiety Inventory*** (Spielberger, 1980): The test form is one page and includes directions, twenty items, and space for recording responses. The respondents are asked to report how frequently they experience specific symptoms of anxiety before, during, and after examinations (see appendix).

Issues for Construct Validation:

1. Is the TAI to be classified as a measure of trait or state anxiety?

2. Are AAT+ and AAT- independent dimensions or simply reflections of test anxiety?

3. Test anxiety/fear of failure as negative motivation just explains half the story of performance in evaluative situations. The positive motivation (e.g., need for achievement) which is also aroused in evaluative situations makes a contribution when explaining differences in test performance (Rand et al., 1989; Naveh-Benjamin, McKeachie, Lin, & Tucker, 1986).

4. Is test anxiety a cognitive construct? (Hunsley, 1987). Is the information processing interpretation valid?

5. The test anxiety/performance relationship is a fundamental concern, yet its causal direction has remained uncertain.

6. Does test anxiety interact with test format and test-taking strategy to affect students' performance? (Schmitt & Crocker, 1981)

7. Tobias (1985) and Sieber, O'Neil and Tobias (1977) discuss information processing approaches to the study of test anxiety, suggesting that anxiety can interfere with learning and performance at different stages of processing. Anxiety could hinder the preprocessing, processing, and postprocessing of presented material. Tobias (1985) discusses competing hypotheses concerned with how anxiety might hinder information processing. The interference hypothesis suggests that the evaluative threat posed in testing situations impedes the retrieval of already learned information for high-anxious students by reducing their cognitive processing resources. The deficit-skills hypothesis argues that inadequate initial preparation and poor test-taking skills account for the reduced performance of high-anxious students. Tobias cites evidence suggesting that

these competing hypotheses are not mutually exclusive, and that both can yield instructionally relevant research.

The Tobias (1985) work is just one example of an attempt to clarify which cognitive processes are affected by anxiety. Other work along these lines by Naveh-Benjamin, McKeachie, and Lin (1987) has used non-evaluative situations to distinguish students with retrieval problems from students having organizational and other problems. Identifying the nature of the relationship between anxiety and information processing could serve as a foundation for designing differential treatment programs for high anxious students that may be more effective in improving learning and performance than global test anxiety reduction programs or study skill improvement programs.

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II. SELF REGULATION AND RELATED CONSTRUCTS

Title: COGNITIVE ENGAGEMENT AND SELF-REGULATED LEARNING

Definition: Self-regulated learning is defined by Corno (1989) as the "internalization of learning and task management strategies, coupled with the ability to mobilize and maintain them when situations demand" (p. 2). It is manifested in four kinds of cognitive engagement (recipience, resource management, task focus, and comprehensive engagement) which are characterized by differential utilization of the component cognitive processes of Acquisition and Transformation (see also Howard, 1990).

Constituent and Related Constructs:

1. **Component Cognitive Processes**

   a) ***Acquisition processes*** (Alertness and Monitoring) are involved in taking in information from the environment.

   b) ***Transformation processes*** (Selectivity, Connecting, and Planning) alter the information by selecting relevant new information, connecting it to information already available in memory, and organizing a task approach or performance routine.

2. **Cognitive Engagement**

   a) ***Recipience*** is the most passive of the types of cognitive engagement, requiring low level acquisition processes and, very little if any, transformation processes.

   b) ***Resource management*** requires higher levels of acquisition in combination with low level transformation processes.

   c) ***Task focus*** emphasizes use of high level transformation processes with acquisition processes called upon as needed.

   d) ***Comprehensive engagement*** requires the most mental effort, using high levels of both acquisition and transformation processes.

The interaction of cognitive engagement with instructional activities is hypothesized to influence student motivation.

Theoretical Base:

Self-regulated learning encompasses cognitive, conative and affective factors in learning. It is one of a number of constructs that have been identified by applying the information-processing metaphor to conation. The advantage of this approach is that it demands a consideration of the processes that relate conative constructs to one another.

Assessment Procedures:

1. ***Self-Regulated Learning Scale*** (Corno, Collins, & Capper, 1982)

The SRL scale consists of two subscales, Acquisition and Transformation, which can be decomposed into component processes.

2. ***Structured Interview*** (Zimmerman, & Martinez-Pons, 1986; Zimmerman & Martinez-Pons, 1988; Zimmerman & Martinez-Pons, 1990).

Issues for Construct Validation:

1. Is self-regulation to be understood narrowly as a cognitive phenomenon, or are there conative aspects to be distinguished? In what sense are these aspects "executive" processes (Gitomer & Glaser, 1987).

2. Howard (1990) investigated the construct validity of the SRL model and found evidence for reasonable overall internal consistency and predictive validity, but found that the Acquisition and Transformation scales were not clearly separable. Howard points out that while cognitive processes such as Acquisition and Transformation may be conceptually distinct, they may be used by students in ways that are highly interactive and idiosyncratic to each student. If this is the case, cognitive science and instructional psychology research will need to clarify how these processes are used by students.

3. One hypothesis of the SRL model is that more able learners will be able to shift more effectively between active and less active forms of cognitive engagement as task demands or interest dictate. Does greater shifting occur for more able learners?

4. How do social and task achievement incentives interact with cognitive engagement? Resource management involves reliance on external resources, and can be very effective for getting high grades, but it is less likely to result in as much learning as would occur if the learner was exercising more of his or her own information processing. What are the effects of changing the nature of tasks and their incentives on the types of engagement students use and the learning and performance outcomes associated with them (Howard, 1990).

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Example Study Abstracts:

1. Howard, D.C. (1990). *Variations in cognitive engagement as indicators of self-regulated learning*. Presented at the annual meeting of the American Educational Research Association, Boston.

   Thirty-two grade 12 students of average or higher achievement were given a series of six academic tasks designed to vary in terms of cognitive demands and motivational effects. In addition to the SRL Rating Scale, a metacognitive questionnaire (MQ) and traces of students' cognitive processes written during task were used to test Corno's model of self-regulated learning. A multitrait, multimethod analysis was conducted, using the three measures of SRL process as different methods and the Acquisition and Transformation subscales on each measure as different traits.

2. Zimmerman, B.J., & Pons, M.M. (in press). Construct validation of a strategy model of student self-regulated learning. *Journal of Educational Psychology.*

   Using student self-report of methods used for specific examples of classroom learning, homework, and studying for tests, Zimmerman et al. (in press) identified 14 categories of SRL, 5 of which reflect Corno's volitional strategies. (Corno, 1989, pp. 21-22)

Title: ACTION CONTROL VS. STATE ORIENTATION

Definition: The term "action control" refers to the self-regulatory mechanisms that mediate the enactment of an individual's intended action(s).

Constituent and Related Constructs:

1. ***Action Oriented.*** The action-oriented individual "is characterized by an intentional focus on a situationally appropriate action plan" (Kuhl & Kraska, 1989, p. 366). He or she is able to attend successively or even simultaneously to all of the following: (1) the present state; (2) some future state; (3) a discrepancy between the present and future states; and (4) an appropriate action that will lead to the transformation of the present state into the desired future state (Kuhl, 1987).

2. ***State-Oriented.*** In contrast, the state-oriented individual is unable to deal effectively with these four elements. His or her behavior is marked by the overmaintenance of an intention that is either unrealistic or should be postponed. This overmaintenance can result in a "fixation on past, present, or future states, for example, on a past failure to attain a goal, on the present emotional consequences of that failure, or on the desired goal state itself" (Kuhl & Kraska, 1989, p. 366).

Theoretical Base:

Understanding the choices individuals make has been the primary concern of most theories of human motivation. The problem of choice has been important because it is assumed that once we know what goal a person has chosen, and what action they will choose to attain that goal, then we should be able to predict their behavior (Kuhl, 1986). For example, expectancy-value models (e.g., Feather, 1982) use two parameters to predict an individual's behavior: the expectation that an action can be performed to yield the desired results, and the personal value of all the outcomes based on that action. According to expectancy-value theory, all individuals' behavior is a function of a consistent algebraic relationship between these two parameters. Kuhl (1977, 1982a) reports that people use idiosyncratic and highly context-specific rules to combine expectancies and values, sometimes basing decisions only on value information, other times using only expectancy information, and still other times combining them disjunctively. The failure of expectancy-value theory to account for this data suggested that "additional processes had to be postulated to mediate the implementation and maintenance of intentions" (Kuhl, 1990, p. 2).

These processes have been labeled will power, ego strength, volition, or self-regulation in the past, but have largely been ignored since Lewin's (1926) criticism of Ach's theory of volition (discussed by Kuhl, 1984). Heckhausen and Kuhl (1985) developed action-control theory, an information processing theory that considered intentional states as distinct from motivational states. The predecisional state is labeled "motivation" and the postdecisional state is labeled "volition." When an individual makes a decision, the motivational state is terminated and he or she enters the volitional state. This distinction is necessary to account for non-rational behavioral paradoxes, such as failing to switch television channels from a boring program to a more interesting one.

Action control theory led to empirical research on an individual difference construct labeled action orientation (vs. state orientation). Action oriented individuals tend to take immediate action to achieve their goals, while state oriented individuals tend to focus on past difficulties and situationally inappropriate intentions. More recent work by Kuhl and Kraska (1989) has focused on performance-based assessments of children's use of motivation and emotion control strategies, finding relations between these and academic performance.

Assessment Procedures:

1. The ***Action-Control Scale*** (Kuhl, 1985). The measure consists of three subscales:

   a) ***Performance-related*** action versus state orientation (AOP)
   b) ***Failure-related*** action versus state orientation (AOF)
   c) ***Decision-related*** action versus state orientation (AOD)

"Each subscale contains 20 items. Each item specifies a situation and two response alternatives, one indicating an action-orientation and the other one indicating a state-orientation response. Each subscale contains ten items assessing behavioral manifestations of action and state orientations and ten items assessing cognitive manifestations." The scores for the subscales are the total number of action-oriented responses given by the subject. Each subscale is scored separately and no combined score is given. The scale takes approximately 15 minutes to complete.

Estimates of internal consistency for the subscales are AOP (.74), AOF (.79), and, AOD (.79) (using Cronbach's alpha and N= 115). Additionally, the moderate correlations (<.36) between AO-scores and several personality variables (test anxiety, extroversion, self-consciousness, achievement motivation, future orientation, and cognitive complexity) reflect a theoretically expected overlap and at the same time indicate that a sizable proportion of variance in action-orientation scores cannot be accounted for by such personality variables. (See Kuhl, 1984.)

2. Kuhl has also developed a computerized game-like measure that aims to assess action vs. state orientation directly, especially designed for children. This measure consists of a computer presented task where respondents gain points for successful performance (the points are linked to some material rewards). Periodically, a race between a black "monkey" and a white "monkey" appears in the upper portion of the computer's screen. If, for instance, the black monkey wins, the child will gain a number of points, but if the white monkey wins the computer will lose a certain number of points. State-oriented individuals are more likely to show higher variances when the monkeys appear on trials that when they don't.

3. There are several lines of validation studies, including research on free- and forced-choice activities (Kuhl, 1982b), failure induction research (Kuhl, 1987), and research on inducing action orientation (see Kuhl, 1985 for a review).

Issues for Construct Validation:

1. Problems with self-report data. Relations between questionnaire and performance-based measures need further study.

2. The extent to which state vs. action orientation is sensitive to situational manipulations and interventions requires further study.

3. The relationship between state vs. action orientation to ability is not yet clear. Action vs. state orientation could be considered a subcomponent of general ability or a construct that is somewhat distinct from it.

4. Are volitional processes to be regarded as metacognitive and metamotivational phenomena or as a distinct category at the same level as cognitive and motivational phenomena?

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Title: MASTERY VS. PERFORMANCE ORIENTATION

Definition: Mastery and performance learning orientations are thought to result in different patterns of cognitive, affective, and behavioral responses to achievement tasks (Dweck & Leggett, 1988). ***Mastery orientation***: is characterized by seeking of challenging tasks and the maintenance of effective striving under failure (Dweck & Leggett, 1988). In achievement tasks, mastery oriented individuals exhibit solution oriented self instruction and improved and sustained performance in challenging situations (Dweck & Diener, 1978, 1980). Unsolved problems are seen to be challenges, and attention becomes focused on strategy and effort. ***Performance orientation***: is characterized by avoidance of challenge, impaired performance, and negative affect in the face of failure (Elliott & Dweck, 1988). Individuals who are performance oriented seek to maintain positive judgments of their ability and avoid negative judgments (Nicholls & Dweck, 1979).

Constituent and Related Constructs:

1. **Personal Goals.** The two orientations are thought to be the result of different personal goals, either learning goals (for mastery orientation) or performance goals (for performance orientation) (Elliott & Dweck, 1988):

   a) ***Learning goals*** seek to increase competence.
   b) ***Performance goals*** aim to document ability

   Elliott and Dweck define these goals as constructs that organize behavior in terms of cognitive and affective factors, allowing researchers to better understand the conditions under which the two orientations arise.

2. **Entity vs. incremental theories of intelligence** (Dweck, Tenney, & Dinces, 1982): One's perception of the malleability of intelligence is thought to determine learning orientation.

   a) An ***entity theory of intelligence*** means that the person believes that social and personality attributes are fixed. Such a theory leads to performance goals, and a performance oriented response to failure. The entity view can be described by the statement "there are some things you just won't be good at no matter how hard you try."
   b) One who holds an ***incremental theory of intelligence*** believes that social and personality attributes are malleable (Goodnow, 1980). An incremental theory is said to lead to learning goals and a mastery orientation. It is based on the premise "you can learn anything if you try."

Theoretical Base:

Dweck's research program places motivational measures within the context of general theories of achievement goals. It attempts to show how mediators such as attributions and anxiety follow from a focus on particular goals. Some relevant theories include attribution theory (Weiner, 1972, 1982), evaluation anxiety theory (Mandler & Sarason, 1952; Wine 1971, 1982), social learning theory (Battle, 1965), and learned helplessness theory (Seligman, Maher, & Solomon 1971).

Attributions, or the way in which individuals explain events, guide one's reactions toward learning events, and thus contribute to learning orientation. Dweck and Leggett (1988) suggest that attributional style arises from implicit theories of intelligence. For example, if one sees intelligence as being fixed, one will attribute failure to a stable, internal event (ability), and a performance oriented response will result. Implicit theories of intelligence help formulate goals. According to Elliott and Dweck (1988) goal orientation interacts with confidence in order to set in motion a sequence of specific processes that influence task choice, performance, and persistence.

Assessment Procedures:

1. The ***IAR*** (Crandall, Katkovsky, & Crandall, 1965) is an attributional scale for primary school children used to classify subjects as mastery oriented or performance oriented. It consists of 34 forced-choice items, each describing a positive or negative achievement experience which occurs in children's daily lives. The two choices are (1) the event was caused by the child, or (2) the event occurred because of someone or something in the environment.

   The instrument provides a total internal attribution score. The total score is computed by taking the sum of the internal negative responses and the internal positive responses. Subjects with a high scores are classified as likely to display mastery orientation, those with low scores as likely to display performance orientation.

   This scale was chosen because past research (Dweck, 1975) showed that the major difference between the mastery and performance orientations was in the respective tendency to neglect or emphasize the role of effort in determining failure. Mastery oriented responses focus on effort as the major cause of failure, resulting in renewed attention toward the task. Performance oriented responses, on the other hand, focus on failure as a result of ability, and added effort seems useless.

2. ***Hypothesis testing*** (Diener & Dweck, 1978): Dweck and others have used geometric hypothesis problems to assess the differences between performance and mastery oriented individuals. Subjects are shown cards, in sequence, each with two geometric figures that vary on three dimensions: color, form, and symbol. One stimulus, that the experimenter has chosen, is correct for the entire deck. Subjects point to the left or the right figure and the experimenter says correct if the figure contains the stimulus chosen. The same procedure follows for successive cards. The subject attempts to figure out what the experimenter's hypothesis is. Feedback is given after each card, then after three cards as the subject becomes familiar with the task.

After a few trials, the experimenter begins to respond "incorrect" regardless of the subject's answer. The experimenters monitors the nature, timing, and relative frequency of achievement related cognitions after the uncontrollable failure. Performance deteriorates. Performance oriented subjects made attributions for failure to lack of ability. Mastery oriented subjects, rather than making attributions, engaged themselves in self-monitoring behavior and continued trying.

Issues for Construct Validation:

1. Many of the studies mention that both performance and mastery oriented students are equal in terms of ability, but it is not clear how ability is measured. This question is important because it seems likely that ability will affect one's learning orientation; it also seems likely that one's orientation will affect ability. If a student responds to failure with deteriorated performance during math, that would affect math learning. Then, how do learning and performance oriented students manage to perform identically on ability measures in Dweck's studies?

2. Mastery orientation vs. performance orientation seems to bear at least some similarity to the distinction between achievement via independence and achievement via conformance. What is the empirical relationship between these sets of constructs?

3. The distinction also should relate to other effort based constructs such as mindfulness and effort avoidance. Test anxiety also appears to be closely related.

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Crandall, V.C., Katkovsky, W., & Crandall, V.J. (1965). Children's beliefs in their own control of reinforcement in intellectual-academic situations. *Child Development, 36*, 91-109.

Dweck, C.S., & Leggett, E.L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*, 256-273.

Related References:

Diener, C.I., & Dweck, C.S. (1978). An analysis of learned helplessness: Continuous changes in performance, strategy, and achievement cognitions following failure. *Journal of Personality and Social Psychology, 36*, 451-462.

Diener, C.I., & Dweck, C.S. (1980). An analysis of learned helplessness: II. The processing of success. *Journal of Personality and Social Psychology, 47*, 580-592.

Elliott, E.S., & Dweck, C.S. (1988). Goals: An approach to motivation and achievement. *Journal of Personality and Social Psychology, 54*, 5-12.

Title: MINDFULNESS

Definition: The intentional, purposeful, metacognitively guided employment of non-automatic, hence effort demanding, mental processes. An interaction of motivational states and cognitive actions—of will and skill.

Constituent and Related Constructs:

1. Mental effort investment
2. Action orientation
3. Need for cognition
4. Perceived self-efficacy
5. Depth of processing
6. Mastery orientation

Theoretical Base:

A learner rarely applies knowledge and skill automatically when needed or appropriate. There must be an *intention* to mobilize and apply knowledge and skill to a new situation. This intention mobilization is mentally taxing—it demands *effort investment* in *mindful* application of knowledge and skill. The difference between what a person can do and what a person actually does in a situation indicates the effect of mindful effort investment. The distinction between mindfulness and mindlessness is also parallel to that between controlled and automatic processing.

Mindfulness is a function of stable individual differences but also of situational, perceptual and instructional conditions. Persons differ in their tendency to engage in and enjoy effortful cognitive activity vs. to minimize mental effort in processing incoming information. Learners high in mindfulness perform better when given loose guidance and enough freedom to work on their own, but react when given specific and continuous guidance. The opposite is seen for learners low in mindfulness. High mindful learners perform better when working alone than in teams. However, in teams that also allow independent activity, highs are unaffected while low mindful learners tend to loaf. Mindful learners intentionally seek out opportunities to invest mental effort. They are selective—mindful about some aspects of a situation while ignoring others. Mindlessness occurs when a situation is perceived as familiar, undeserving of effort, or *too demanding*—the sequence of events is passively allowed to unfold without actively engaging it.

Assessment Procedures:

1. AIME Questionnaire (Salomon, 1981). Self report of number and kind of non-automatic mental elaborations in various situations.

2. Need for cognition questionnaire (Cacioppo & Petty, 1982).

Issues for Construct Validation:

1. Mindfulness seems to be both a "trait" and a "state." The degree of stability of the "trait" and the conditions that influence the "state," or interact with the "trait," need elaboration.

2. Mindfulness appears to be an aptitude complex—a group or cloud of features. What are its constituents? What are its relations with a variety of other variables (listed above as constituents)?

3. The questionnaires are self-report and may be transparent. State measures may be particularly susceptible to situational suggestion.

Key References:

Salomon, G. (1987). Beyond skill and knowledge: The role of mindfulness in learning and transfer. *Invited address to the Second European Conference for Research on Learning and Instruction*, Tubingen, FRG, September.

Related References:

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Salomon, G., & Leigh, T. (1984). Predispositions about learning from print and television. *Journal of Communication, 20*, 119-135.

Example Study Abstracts:

1. Salomon, G. (1984). Television is "easy" and print is "tough": The differential investment of mental effort in learning as a function of perceptions and attributions. *Journal of Educational Psychology, 76*, 647-658.

   Children watch even mentally demanding TV programs in a shallow way. When asked to draw inferences from the program under "watch for fun" conditions, correlation of inference making with IQ is -.09; under "watch for learning" conditions, correlation is .59. Correlation of self reported effort investment in the program and inferential learning measured later is .58.

Title: EFFORT AVOIDANCE MOTIVATION

Definition: An individual motivational system aimed at actively avoiding the investment of effort in learning in achievement situations. Behavior motivated to escape from these situations.

Constituent and Related Constructs:

1. Cognitive appraisal of situational-expectancy of frustration

Theoretical Base:

Effort avoidance is an active system of motivated behavior distinguishable from low need for achievement or high fear of failure. Low need for achievement is characterized by laziness. High fear-of-failure is characterized by striving to achieve. But a person motivated by effort avoidance shows active mental or physical escape, and no intention to succeed. The causes of effort avoidance seem to be frustrating early experiences in a task domain, so the construct is usually domain specific. But experiencing frustration in many school activities can lead to generalized effort avoidance.

Unsupportive, restrictive intervention styles used by parents and teachers appear associated with the emergence of effort avoidance. The more teachers or parents use pressure to motivate such persons, the quicker effort avoidance appears. Effort avoiders use their intelligence to convince their teachers they are not intelligent enough to cope with tasks given them. They tend to score lower in group tests than in individual intelligence tests. Effort avoidance strategies include: working very slowly; working very rapidly in slipshod fashion; stopping work when praised; producing feelings of resignation to induce teachers not to push them; generating various excuses for not working.

Assessment Procedures:

Effort avoidance scale based on a questionnaire with items such as: "I really can't understand why I should know the multiplication table by heart"; "I can't work when the sun is shining"; "when I'm supposed to write for a long time I get quite tired." The scale has been shown to be unidimensional with negative binomial distribution, and to contribute to prediction of learning criteria even with fear-of-failure partialled out.

Issues for Construct Validation:

1. Further correlational work is needed in relation to measures of achievement motivation, anxiety, ability, effort investment, and content motivation.

2. Need to distinguish "debilitating" or "defensive" effort avoidance from "intelligent" effort avoidance, i.e., intelligent budgeting of minimal effort to reach desired goals.

3. Effort avoidance may be a healthy reaction to exhausting or extremely difficult tasks. Discontinuing work or setting lower standards for performance in such situations needs more study as an adaptive device. Also, the nature of prior frustrations and the appraisal of situations that lead to effort avoidance are not yet well understood.

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Title: SELF-MONITORING DURING TEST PERFORMANCE

Definition: In most general terms, the able self-monitor will "allocate resources optimally." This involves being sensitive to changing situation demands and being flexible in matching one's resources to those demands and, at the same time, conserving resources in anticipation of future demands. Examples of demands in the testing situation are: item difficulty and processing requirements given the time constraints, item format, item content, and environmental things such as room temperature and crowding, etc. One's resources in the testing situation include: time, motivation, attention, effort/energy/persistence, thought power/creativity/ingenuity, patience, etc. Effective allocation may differ from one person to another (e.g., how much time or effort to devote to a difficult problem worth many points). For a given person, the optimum component allocation is that which produces the best overall score.

Constituent, Overarching, and Related Constructs:

1. Action control theory: state vs. action orientations (Kuhl, 1985)
2. Testwiseness (Sarnacki, 1979).
3. Test anxiety; cognitive interference (Sarason & Sarason, 1987)
4. Attention maintenance (Cooper & Regan, 1982) and allocation (Miller & Weiss, 1982)
5. Reading comprehension monitoring (Wagner & Sternberg, 1987)
6. Mastery vs. performance orientations (Dweck & Legget, 1988)
7. Problem solving objectivity (Bloom & Broder, 1950)
8. Satisficing: Siegler's (1988) notion of perfectionist—people vary in their threshold level for optimum performance
9. Recovery: ability to get back on track after a challenging problem or distraction
10. Flexibility (fluid ability) in solution strategies; ability to "shift gears" in response to change of task format/content, etc.
11. Sports psychology, Pacing.

Theoretical Base:

Sternberg (1981) suggested "that the success of psychometric tests in predicting various kinds of external criteria, such as school grades, is largely due to the indirect assessment by these tests of such higher-order skills as planning strategy, monitoring strategy, shifting strategy, and the like" (p. 1188). Although excess reliable variance might improve predictive validity, it is still a contaminant which clouds the construct validity and thus the score interpretation (Messick, 1989).

Self-monitoring may be one of those systematic components that contributes to performance. Self-monitoring during testing refers to such executive, metacognitive processes as keeping track of progress in light of time remaining and adjusting test taking strategies accordingly, as well as keeping attention focused on the tasks at hand. Good self-monitors are thought to be able to meet the attentional and strategic demands of the task and are thus free to perform the problems to the best of their ability. Poor self-monitors may not adequately meet the attentional and strategic demands of the task; those demands may thus interfere with performance.

One basic hypothesis is that the performance of less able self-monitors will be more affected by changes in item position than that of more able self-monitors. But by the nature of their administration conditions, tests can require varying amounts of examinee monitoring. Thus it would be important for research to allow comparisons of the extent of item location effects in test administration conditions that require more or less monitoring, for examinees differing in their monitoring abilities. This type of research is well-suited to using an aptitude treatment interaction (ATI) approach, with the "A" of self-monitoring, the "T" of experimentally manipulating the amount of self-monitoring the testing situation demands, and the dependent variable a measure of item location effects.

Assessment Procedure:

Since this construct has only recently been the subject of study, the assessment procedures for measuring it are still evolving. Assessment should be based on a battery of measures that converge on the construct. Two aspects of assessment are important for measuring self-monitoring: self-report and performance. Although self-report data is easier (cheaper, etc.) to collect, it cannot offer information as to whether the respondent actually performs the way he or she claims to: thus, witnessing the self-monitoring strategies during actual performance is necessary to augment the self-report data.

1. Potential Self-Report Measurement Techniques

a) ***Smith's (1982) measure of cognitive monitoring.*** For example, a sample item from this measure is: Imagine that your younger brother or sister was about to take a standardized test like the PSAT. What things would you tell him/her about in order to get the best score?

b) ***Wagner & Sternberg's (1987) task.*** Students control the duration of passage display for several reading comprehension passages (given the total time constraint) based on what type of information they would be tested on: gist, main idea, details or analysis. The time allocation score was a measure, in seconds, of how much more time was allocated on average to the two more difficult question types (detail and analysis) than to the two less difficult question types (gist and main idea). They found that individual differences in time allocation for reading comprehension passages made a significant contribution in predicting performance on those associated questions, over and above what standardized reading and vocabulary measures accounted for.

c) ***Responses to made-up vignettes.*** For example, a sample item would be: Suppose you had 10 multiple-choice problems remaining on an important exam. Would you rather know or not know that you have 2 minutes left? Why?

2. **Potential Performance Measurement Techniques**

a) Testwiseness measure.

b) Overall score as lowest in a series of tasks.

c) Recovery after challenges: comparison of performance before and after an impossible problem.

d) Change of task format or instructions requires adaptation.

e) Sensitivity to changes in timing demands: comparison of performance on similar tasks in two situations differing in time allowed.

f) Waste motion: the degree to which subject pays only as much attention to task as is necessary to get by and no more.

g) Sensitivity to changes in item difficulty: differential time allocation to easy and hard problems.

Issues for Construct Validation:

1. How general is self-monitoring? Is there a self-monitoring ability for math tests that may or may not be related to that for reading tests? Or is there a basic ability that applies to all timed important testing situations regardless of content? It is likely that there is some general self-monitoring ability that operates across testing contexts. However, different testing conditions may make more or less monitoring demands. These differences may be more quantitative than qualitative: Thus, it makes sense to combine measures from the various tasks in the battery that may be different in nature. The empirical intercorrelations will shed some light on whether there is a general self-monitoring ability. If there is some general self-monitoring that applies to the series of tasks in the battery, then positive correlations would be expected.

2. Part of self-monitoring is recognizing the demands of the situation (in order to meet them most efficiently). But recognizing the demands of the problem is related to being able to solve the problem. Therefore, the ability being tested is likely to be correlated with the

self-monitoring ability, even though they are logically different. Also, it is necessary to examine discriminant validities to see whether self-monitoring is more than just a measure of "fluid ability" (including flexibility and strategy shifting).

3. In research on self-monitoring, it is important that the participants be motivated to perform "as if the test counts."

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Title: FLOW

Definition: "Flow" is a term used to describe the subjective experience of a person deeply immersed in a challenging activity. A "flow" experience is characterized by a cognitive state of total concentration and absorption. This cognitive state is accompanied by feelings of intrinsic motivation, intrinsic interest, enjoyment and/or exhilaration. An individual in "flow" is engaged in a self-constructing process, where the incremental development of context specific skills, understandings or capabilities is required in order to complete a challenging task or activity. For this reason, an individual emerges from flow experiences as a more complex and developed being, with new capabilities and/or understandings.

Flow is more likely to occur when an individual's abilities are well-matched to the level of challenge in the situation. The flow situation is one in which goals, feedback, and rewards emerge continuously, resulting in intense task involvement. Thus, extrinsic rewards are not needed for the flow to continue because rewards are found emerging directly from the person's activity engagement.

Constituent and Related Constructs:

1. ***Mastery Orientation.*** Individuals who seek challenging tasks and maintain effectiveness under failure are more likely to engage in activities that result in flow.

2. ***Intrinsic Motivation.*** A desire to engage in an activity for its own sake is more likely to result in flow because the rewards necessary for flow to continue can be found in the task.

3. ***Comprehensive Cognitive Engagement.*** A high level of cognitive engagement is hypothesized to be more likely to lead to flow.

4. ***An Experience.*** An important part of flow is the subjective experience associated with it. Dewey (1934) describes an experience as a life episode that is distinct and special, where one feels a sense of flow or unity between the diverse aspects of the experience:

> "Experience" in this vital sense is defined by those situations and episodes that we spontaneously refer to as being "real experiences"; those things of which we say in recalling them, "that was an experience." In such experiences, every successive part flows freely, without seam and without unfilled blanks, into what ensues. At the same time there is no sacrifice of the self-identity of the parts. A river, as distinct from a pond, flows. But its flow gives a definiteness and interest to its successive portions greater than exist in the homogeneous portions of a pond. In an experience, flow is from something to something. As one part leads into another and as one part carries on what went before, each gains distinctness in itself... An experience has a unity that gives it its name, that meal, that storm, that rupture of

> friendship. The existence of this unity is constituted by a single quality that pervades the entire experience in spite of the variation of its constituent parts. (Dewey, 1934, pp. 42-44)

Theoretical Base:

The flow experience is a complex process made possible by the synergistic interaction of various constituent components within a single activity. The experience requires strong personal agency beliefs and feelings of self efficacy, clear goals, consistent and constructive feedback and the ability to self-regulate one's behavior. These components are not only required, but they are developed further by the process of flow, so it is a self-constructing and self-enhancing process.

A person experiencing flow feels a sense of control and believes that his or her skills and competencies are sufficient to deal with the challenging activity at hand. This activity is itself directed by goals and bound by rules or laws (natural or artificial) of some sort. These goals and rules provide the individual with clear and constant feedback on progress and performance. This flow of information allows the individual to make quick and frequent adjustments in behavior, strategy or pace. During this activity, the individual's concentration can become so intense and focused that the individual has no psychic energy left over to dwell on other subjects or problems. With this focusing and ordering of attention, all sense of self-consciousness disappears and an individual may experience a sense of unity with the environment or the activity engaged in. This subjective experience is so gratifying that the individual will return to engage in the process again and again.

Certain activities designed by cultures incorporate all the components described above, thereby making flow more likely to occur. Sports, dance, art, play, and ritual activities are good examples. These activities are able to facilitate the development of competencies, knowledge and skills while providing enjoyment to participants.

Assessment Procedures:

Investigators of the flow construct have employed a procedure called the Experience Sampling method (Csikszentmihalyi & Larson, 1984; 1987; Csikszentmihalyi, Larson, & Prescott, 1977). This procedure requires that subjects carry an electronic pager with them for a week. Signals are sent to these pagers at random intervals to cue subjects to fill out self-report measures.

The self-report measures ask subjects to describe their current situations and subjective states. They are also asked to respond to a series of likert scale items concerned with their emotional and cognitive state at the moment at which they were paged (Larson, Csikszentmihalyi, & Graef, 1980).

Issues for Construct Validation:

1. The degree to which flow is an intra-individual variation that all persons experience versus an inter-individual variation (in quantity or quality) needs investigation. The state vs. trait character of the construct needs explication.

2. Multi-measure research should be conducted, using the instruments developed by Csikszentmihalyi and measures of other constructs that seem to be incorporated within the construct of flow.

3. Claims for variation in quality and quantity of learning and cognitive performance deriving from flow experiences need investigation.

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Title: FUTURE TIME PERSPECTIVE

Definition: ***Future time perspective*** (FTP) is "the configuration of temporally localized objects" and means-ends structures that virtually occupy an individual's mind in a certain situation (Nuttin, 1985, p. 21).

Constituent and Related Constructs: Future time perspective is comprised of several components, including:

1. its ***extension*** or its length or depth;
2. the ***perceived instrumentality*** of objects in the FTP (Van Calster, Lens, & Nuttin, 1982);
3. the ***density*** of the distribution of objects within different time periods;
4. the ***degree of structuration*** among the objects, for example, whether the objects are tied together in means-ends relationships, or merely juxtaposed together;
5. the ***degree of vividness*** and realism of the objects as they are perceived by the subject, as a function of their distance in time.

Related Constructs: Time perspective can be distinguished from ***time attitude*** and ***time orientation***. Time attitude refers to an individual's positive or negative affect directed generally to the past, present, and future. Time orientation is the preferential direction of an individual's behavior or thoughts, whether this is the past, present, or future. For example, elderly people may have a past time orientation, while younger people might have a future time orientation (Nuttin et al., 1985).

Theoretical Base:

The study of time perspective counts among its roots a publication by Lewin (1931) where he discussed how a child's narrow focus on the present gradually extends itself in both spatial (social) and temporal (mostly future) directions as a consequence of the child's personal and constructive activities (as cited by Nuttin et al., 1985). The term 'time perspective' was adopted by Lewin (1942; 1946) following its appearance in Frank's (1939) cultural-philosophical article on 'time perspectives.' Lewin (1952, p. 75) defined time perspective as "the totality of the individual's view of his psychological future and his psychological past existing at a given time." Since the 1950s, the study of time perspective has grown somewhat, with overlapping branches of research creating terminological confusion. The multitude of time perspective measurement instruments, many of them attitudinal in nature, has hindered the interpretation of studies purporting to examine the same temporal phenomena.

Nuttin et al.'s (1985) work addresses the hypothesis that the objects of time perspective are among the determinants that regulate behavior. Nuttin et al. (1985) define two aspects of time perspective. From the subject's point of view, time perspective is the "temporal zone to which his mental view virtually extends itself when considering the objects and conscious determinants of his behavior" (Nuttin et al., 1985, p. 21). In this sense, time perspective is much akin to spatial perspective in painting or drawing. From an 'objective' viewpoint, "time perspective is the totality of objects located within a more or less extended temporal zone insofar as they are virtually present to the subject in relation to his behavior" (Nuttin et al., 1985, p. 21). A virtually-present object becomes consciously present when demanded by situational or motivational forces. For example, the object "lunch" is part of one's future time perspective. It has a temporal sign of "lunch-time," that is, the time at which lunch is expected. The object lunch is virtually present in our minds, and now and then becomes consciously present when, for example, we read about it or become aware of our hunger. The object—lunch—is part of our behavioral world in that it is a goal object to be obtained.

The study of future time perspective has practical implications. A long, realistic, and accessible time perspective facilitates the effectiveness with which an individual can formulate and realize long-term projects. To bring an important long-term project to fruition, an individual must regulate and coordinate the instrumental steps necessary along the way. Perhaps some students are unable to perceive the propaedeutic nature of their present studies to a far-distant career, so they put forth insufficient effort in school. At a more global level, in some poor countries, the difficulties associated with satisfying fundamental physiological needs may continually dominate behavior. Psychological treatment extending time perspective, in parallel with economic treatment, may be necessary to improving living conditions.

Assessment Procedure:

Nuttin et al.'s (1985) approach to measuring time perspective is called the ***Motivational Induction Method (MIM)***. A MIM analysis consists of two stages, paralleling the distinction between the "objective" viewpoint and the "temporal" viewpoint. Both analyses involve the use of two projective questionnaires to obtain a representative sample of the interesting or motivating objects that define an individual's time perspective. The first questionnaire contains 40 positive motivation inducing stems, such as "I hope...," "I am resolved to...," and "I am striving for...." The second questionnaire consists of 20 negative stems, such as "I would oppose it if..." or "I would not like it at all if...." The respondent is instructed to complete the sentence using whatever object of personal tendencies, efforts or desires comes to mind when reading the inducers.

The completed statements are subjected to a content analysis to determine the nature of the motivational objects defining the respondent's time perspective. The individual motivational objects are put into four broad categories related to the self, others, material objects, and conceptual entities. The objects are subsequently divided into about 100 subcategories. Besides object categories, several activities or behavioral relations are distinguished in the subject's responses. (Nuttin et al. (1985) lists the main categories in MIM content analysis.)

Following the content analysis, the objects are temporally coded by assigning to each object the time period in which it "normally" happens (e.g., ages 6-12, 12-18, 18-25, etc.). The individual's conception of time is hypothesized to develop as a result of social and biological factors, and to result in knowledge in the form of temporal signs. These temporal signs, for example, the average age of marriage, collectively are called the "social clock." An individual who decides to marry "very early" makes a subjective temporal localization that is relative to the mean age of marriage in his or her relevant cultural or peer group. By using the "normal" or "average" temporal localization of an object within an individual's social group, the measurement problems associated with the subject's personal estimation of time are avoided. Finally, the aggregation of the temporal localizations of a respondent's motivational objects is taken as an indicant of the mean extension of that individual's future time perspective.

To obtain estimates of the coding reliability of MIM data, the analysis and coding of motivational contents is usually completed by two trained judges working independently. The percentage of overlapping codings is used as the index of reliability. Trained judges reach an intercoder-reliability of 90 to 95 percent for responses to positive inducers (Cossey, 1974; Lens, 1971b; Nuttin & Grommen, 1975; Verstraeten, 1974). For less trained judges, and for codings of negative inducers, the reliability ranges from 80 to 90 percent. The MIM also appears to be reasonably stable over time. Verstraeten (1974) divided a group of 118 adolescents into two subgroups. He found that the correlation between the two groups for the main motivational categories was .97.

The validity of the MIM has been investigated in a number of studies that examine the susceptibility of MIM motivational category scores to a variety of situational influences. Cossey created two levels of achievement motivation using McClelland et al.'s (1953) methodology in which subjects experience either induced failure on a test (failure condition) or no test feedback (neutral condition). Male subjects in the failure condition expressed significantly higher relative numbers of positive goal objects related to study behavior than males in the neutral condition. Craeynest (1967) demonstrated the relation of MIM scores to food and eating behavior. Thus, the MIM appears to yield samples of the motivational concerns of groups of subjects.

Issues for Construct Validation:

1. Some of the concerns associated with projective assessment techniques are relevant to the analysis of MIM data, even though MIM is not really a projective technique. In particular, the richness and interpretability of MIM protocols is dependent, in part, upon the length of the response to the motivation inducing stem. Furthermore, little is known about the cognitive processes underlying the generation of responses to the question stems.

2. Only a few studies have examined the validity of time perspective scores. For the most part, these studies only show the susceptibility of a participant's FTP score to the

influence of a particular situation. What further steps are needed to demonstrate the validity of FTP?

3. How well does a paper-and-pencil instrument assess a construct such as FTP, which is so strongly situation dependent? Can verbal stems induce motivations similar to those induced by real situations? Would a case study approach be an appropriate methodology to examine to explore FTP within the context of individual lives?

4. Anthropological researchers claim that planned action is prevalent in Western culture, but that this is not necessarily so for other cultures (Suchman, 1987). The whole notion of a future time perspective, with means-ends structures as an essential component might be a predominantly Western construct. Cross-cultural research could illuminate the construct significantly.

5. Temporal signs are calibrated with respect to what is "normal" or "average" in a participant's social group. How is a participant's social group determined? What means are used to establish what is considered "normal" or "average" for that group?

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Agarwal, A., & Tripathi, L.B. (1978). Time perspective: Theoretical considerations, *Psychological Studies*, *23*, 61-68.

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Example Study Abstracts:

1. Bouffard, L., Lens, W., & Nuttin, J.R. (1983). Extension de la perspective temporelle future en relation avec la frustration (Extension of future time perspective in relation to frustration). *International Journal of Psychology*, *18*, 429-442.

   Collected by means of J. R. Nuttin's motivational induction method, the intentions, plans, and goals of 71 frustrated Rwandan Ss (those not admitted to the university) and compared them with those of 47 nonfrustrated Rwandan Ss (admitted to the university) regarding extension of their future time perspective (FTP). As hypothesized, FTP of frustrated Ss was more restricted than that of nonfrustrated Ss (the mean extension score, in number of years, and the proportion of number of references to the near future to the number of references to the distant future). No difference was found before the occurrence of the frustrating situation. An additional analysis based on subjective frustration demonstrated that a significant relationship existed between intensity of experienced frustration and extension of FTP.

2. Lens, W., & Gailly, A. (1980). Extension of future time perspective in motivational goals of different age groups. *International Journal of Behavioral Development*, *3*, 1-17.

   Age-related differences in extension of future time perspective in motivational goals were studied at 3 socioeconomic levels in 417 French-speaking adults in Belgium. The hypothesis of an inverted 'U'-shaped relationship between age and extension of future time perspective was tested statistically. This result was not obtained when using 2 indices of future extension that are borrowed from earlier studies: (a) the proportion of near future references to distant future references, and (b) the mean future extension score in number of years. The proportion of the mean future extension score to the statistically calculated expected life time is proposed as a better index of future extension for comparing age groups. With this new index the hypothesis is confirmed at the 3 socioeconomic levels.

3. Agarwal, A., & Tripathi, L.B. (1978). Time perspective: I. Theoretical considerations. *Psychological Studies*, *23*, 61-68.

The concept of time perspective as a global unified variable is challenged and analyzed in terms of its constituent dimensions, namely, temporal orientation, extension, and locomotion. A projective measure of story writing and its scoring system has been developed to measure these dimensions separately. The reliability and validity of the test are discussed. Empirical study has shown that achievement-oriented persons are also future oriented rather than past or present oriented. However, in their planning for the future they do take into consideration all aspects of the problem dispersed over different zones of time, as revealed by positive correlations between achievement scores on the one hand and temporal extension and locomotion scores on the other. There is a relationship of time perspective variables to motivation. It is suggested that time perspective measures can be used to assess motivation.

4. Van Calster, K. Lens, W., & Nuttin, J. R. (1987). Affective attitude toward the personal future: Impact on motivation in high school boys. *American Journal of Psychology, 100*, 1-13.

Studied the motivational significance of the affective attitude toward the personal future, translated into terms of expectancy-value models in motivational psychology. 230 Dutch males (aged 17-19 yrs) participated. Attitude, motivation, and performance were assessed. An interaction effect of this time concept and the perceived instrumental value of performing well in high school for success in future life on the motivation to study and on exam scores was hypothesized. A positive attitude toward the future combined with a high perceived instrumentality gave the highest motivation to study and the best academic performances. When the attitude was high and the perceived instrumental value was low, motivation to study and school results were low.

III. INTERESTS AND STYLES IN LEARNING

Title: INDIVIDUAL INTEREST

Definition: Individual interest is a relatively enduring and stable preference for certain topics, subject areas, or activities (Schiefele, 1991)

Constituent and Related Constructs:

1. ***Intrinsic Motivation***
2. ***Interestingness/Text-based interest***
3. ***Content Motivation***

Theoretical Base:

In an attempt to provide a theoretical definition of interest, Schiefele and Krapp (1988) propose an "Educational Interest Theory," which regards interest as a "specific form of relationship between a person and an object." This relationship is characterized by a concrete interaction between the person and the object and an enduring, stable disposition or orientation toward the object.

Schiefele and Krapp (1988) suggest three domains within which the interest relationship is expressed:

1. Cognitive domain, in which there is "high cognitive complexity to the object" (p. 6).
2. Emotional domain, described as "stimulating, exciting, and pleasant emotions towards the object" (p. 6).
3. Value domain, in which there is strong subjective meaning and self-intentionality (behavior that is self-directed and not motivated by external rewards or incentives) towards the object.

Prenzel (1988) further elaborates on the qualities of persistence, or the maintenance of the relationship by repeated engagements with the object, and selectivity, or the stability of the content of consecutive engagements over time.

Assessment Procedures:

Common methods of assessing interests in past research have included (but are not limited to) the following:

1. Direct questions of likes and dislikes toward certain topics or school subjects.

2. Indirect questions from which researchers infer that interests exist (for example, by asking for the reasons why someone chose to attend a particular school or how often they work ahead in their textbook).

3. Self-report measures of interest-relevant behavior (for example, asking individuals to monitor how often and for how long they engage in certain activities) (e.g., Harter, 1981).

4. Observation of behavior.

5. Interviews with individuals about their interests or, in the case of young children, with parents and teachers.

6. Observing the need for a theoretically-based means of assessing interest, Schiefele, Krapp, and Winterler (1988) discuss the development of the Study Interest Questionnaire (Winteler & Sierwald, 1987) and provide an example of the most recent revision. In its current form, the SIQ yields two factors: interest and cognitive competence. Future developments of the SIQ will focus on assessing the "tendency or the willingness to acquire knowledge about the object of interest" (Schiefele, Krapp, & Winteler, 1988, p. 7).

Issues for Construct Validation:

1. There is some evidence that high interest learners achieve a deeper understanding than low interest learners. But in what ways does the learning of high interest learners differ from other motivated learners (e.g., extrinsic motivation)? How are interest and the quality of learning outcome related (Schiefele, 1991)?

2. Research needs to address the relationship between learning processes and strategies on the one hand, and interest on the other. Do strategies mediate the effect that interest has on learning?

3. Interest has an emotional aspect or valence associated with it. Does the emotional aspect of interest mediate the effect of interest on learning (Schiefele, 1991)?

4. Working on interesting tasks improves the quality of the experience over less interesting tasks. Hence, interest should be considered a desired outcome of learning, in addition to being thought of as a factor that motivates learning. How can instruction capitalize on individual differences to facilitate the development of interest in academic subjects (Schiefele, 1991)?

Schiefele and Krapp (1988) report three major deficits in past studies of interests: No theoretical definition from which to conduct research; heterogeneous and unclear methods of assessing interests; unspecific, quantitative assessments of cognitive achievement in measuring outcomes of interest rather than specific, qualitative measures. In addition to these considerations, further development of the Study Interest Questionnaire and other measures is needed to permit more components found in the definition of interest proposed by Educational Interest Theory to be assessed.

Key References:

Dewey, J. (1913). *Interest and effort in education.* Boston: Riverside Press.

Krapp, A., & Schiefele, U. (1986). *The development of interests: Research programs in the federal republic of Germany.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco, April.

Schiefele, U. (1991). Interest, learning, and motivation. *Educational Psychologist, 26,* 299-323.

Schiefele, U., et al. (1988). *Conceptualization and measurement of interest.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, April.

Schiefele, U., & Krapp, A. (1988). *The impact of interest on qualitative and structural indicators of knowledge.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, April.

Prenzel, M. (1988). *Conditions for the persistence of interest.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, April.

Thorndike, E.L. (1935). *Adult interests.* New York: Macmillan.

Travers, R.M.W. (1978). *Children's interests.* Kalamazoo: Western Michigan University, College of Education.

Winteler, A., & Sierwald, W. (1987). *Entwicklung und Uberprufung eines Fragebogens zum Studieninteresse (FSI).* Hochschulausbildung.

Related References:

Drotz, B.-M., Sjoberg, L., & Dahlstrand, U. (1984). Interests in engineering education related to sex, achievement, and field of specialization. *Goteborg Psychological Reports, 14,* 1-35.

Lybeck, L., & Sjoberg, L. (1984). Interests in natural sciences and technology: A survey of Swedish research. *Goteborg Psychological Reports, 14*, 1-64.

Sjoberg, L. (1984). Interests, effort, achievement and vocational preference. *British Journal of Educational Psychology, 54*, 189-205.

Sjoberg, L., & Dahlstrand, U. (1985). Subject matter attributes and study interests in post-secondary education. *Goteborg Psychological Reports, 15*, 1-23.

Example Study Abstracts:

1. Schiefele, U., & Krapp, A. (1988). *The impact of interest on qualitative and structural indicators of knowledge*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, April.

   In a replication and extension of an earlier pilot study (Schiefele, Winteler, & Krapp, in press), Schiefele & Krapp (1988) investigated the relationship between interest and the quantity and quality of learning in a sample of freshman education majors (n=21) enrolled in a course on educational research methodology. Interest in education was measured using the "Study Interest Questionnaire" and interest in educational research methodology was assessed using a measure designed specifically for this study. A word association method was used to assess the quantity and quality of knowledge gained following completion of 8 weeks in the course.

   Students indicating a high degree of interest in educational research methodology at the beginning of the semester produced word associations that were more similar to the word associations of "experts" in the field of educational research methodology than students who indicated low interest. No significant difference was found between the low- and high-interest groups for quantity of word associations generated, indicating that interest influences quality rather than quantity of knowledge gained.

2. Prenzel, M. (1988). *Conditions for the persistence of interest*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, April.

   Prenzel (1988) summarizes three studies in which 15-17 year-olds self-monitored and reported various aspects of their participation in activities in their areas of interest. The areas of interest represented were guitar playing (n=7) and computers. One "computer" study looked at participants who had already demonstrated a high interest in computers (n=7), while the other study looked at participants who had expressed an interest in the field but had not had much previous experience with computers (n=10).

   The length of time of self-monitoring varied from one to three months and required participants to record (a) feelings while engaged in the activity, (b) degree of absorption,

(c) perceived difficulty of the activity, (d) perceived proficiency at the activity, (e) number of sessions, and (f) duration of the sessions. Prenzel found that interest was related to frequent engagements with the interest activity, pleasant feelings, a high degree of absorption in the activity, an assessment of task difficulties as neither too easy nor too difficult, and perceived gains in proficiency.

3. Krapp, A., & Schiefele, U. (1986). *The development of interests: Research programs in the federal republic of Germany.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco, April.

Krapp & Schiefele (1986) detail a three-year longitudinal study in which the interests of 12 kindergartners were monitored through observation and interviews with teachers and parents. They concluded that "distinct preferences" already existed in the children studied and that these preferences were more often characterized by the kind of activity rather than the specific object of interest. Preferences were found to change during this time period but did so slowly. The continual development of a particular interest "theme" was observed for only a few children. Stable, similar school and home environments were found to be conducive to interest development. Social support and resource availability also contributed to the development of interests.

Title: SITUATIONAL INTEREST (TEXT-BASED INTEREST)

Definition: Situational interest is concerned with the identification of stimulus characteristics that arouse interest, and the effects of interestingness of text material on reading comprehension (Schiefele, 1991). Anderson et al. (1987) define "interestingness" or text-based interest as the "capacity of material to evoke an emotional response in children" (p. 287). Research has shown that "interestingness" can improve sentence recall and reading comprehension.

Constituent and Related Constructs:

1. ***Content Motivation***
2. ***Individual Interest***
3. ***Intrinsic Motivation***

Theoretical Base:

Over the past ten years, several researchers have been concerned with the topic of text-based interest. Schank (1979), for example, hypothesized that inferences in reading are made from the parts of a text that are considered "interesting" to the reader. Schank proposed three conditions that elicit such text-based interest:

1. the violation of expectations because of unusual, incongruent, or conflicting information.
2. unfulfilled expectations due to the absence of potentially relevant information.
3. the "absolute interest" that is inherent in concepts such as death, danger, power, or sex.

In describing what makes a story interesting, Kintsch (1980) distinguished between emotional interest, or events that arouse the reader, and cognitive interest, which is a result of an integration of incoming knowledge with background knowledge. Cognitive interest is produced by small, optimal deviations from "knowledge-based expectations." (The events in the story can't be too expected or too unusual or interest will not be maintained.) Also important is postdictability—"how well information can be related meaningfully to other sections of the text or to stored knowledge."

Anderson et al. proposed four factors which contribute to text interest:

1. ***Character identification***. Readers are more interested in characters with which they can identify in some way.
2. ***Novelty***. Out of the ordinary experiences are more exciting than descriptions of commonplace events.
3. ***Life Theme***. A personal topic of interest to a particular reader.

4. ***Activity Level.*** Intensity is more interesting than passivity.

In an uncited study, Anderson found support for the novelty and life theme attributes of interest but found no support for the character identification or activity level attributes. He also claimed to find support for the notion that interest affects attention and learning in contrast to the common assumption that interest influences learning by increasing attention.

Building on the work of Kintsch and Schank, Hidi and Baird (1988) have investigated the effect on learning of expositional text in elementary school textbooks. They discuss how children's textbooks often insert interesting but irrelevant anecdotes into text in the hope of catching the reader's attention and maintaining it through the remaining exposition. Hidi and Baird report that their research (Hidi & Baird, 1982) suggests that this strategy does not increase the reader's attention or interest in the main text and may actually distract readers from the main text.

Hidi and Baird (1988) distinguish between knowledge-triggered interest, or that which "springs from certain conceptual relations between new information and prior knowledge" (p. 469), and value-triggered interest, or interest which arises from the relationship between incoming information and the reader's values, desires, and preferences. Knowledge-triggered interest is thought to correspond to Kintsch's cognitive interest and Schank's "violated expectations." Similarly, value-triggered interest is thought to correspond to Kintsch's emotional interest and Schank's absolute interest. Hidi and Baird (1988) believe that it is easier to manipulate knowledge-triggered interest in text because of the "wide range of individual differences in personal values and preferences" (p. 469) that would be inherent in manipulating value-triggered interest. They assume, however, that there are values or preferences that could be of interest across a wide variety of readers or specified reader-groups.

Assessment Procedures:

The focus in this line of research is the effect on learning of interesting text. As such, the emphasis appears to be on the assessment of the amount of learning which occurs as a result of reading an interesting text rather than on the assessment of interest itself. Frequent measures of learning include, for example, immediate and delayed cued recall of sentences (verbal or written) and standardized reading comprehension measures. To determine if a text is "interesting," individuals are often asked to rate how interesting they consider a text.

Issues for Construct Validation:

1. Under what conditions does interesting text result in distraction from the main text and subsequently poorer comprehension?

Key References:

Anderson, R.C., Shirley, L.L., Wilson, P.T., & Fielding, L.G. (1987). Interestingness of children's reading material. In R.E. Snow & M.J. Farr (Eds.), *Aptitude, learning and* *instruction: Vol. 3. Cognitive and affective process analysis* (pp. 287-299). Hillsdale, NJ: Erlbaum.

Hidi, S. (1990). Interest and its contribution a mental resource for learning. *Review of Educational Research, 60,* 549-571.

Hidi, S., & Baird, W. (1988). Strategies for increasing text-based interest and students' recall of expository texts. *Reading Research Quarterly, 23,* 465-481.

Hidi, S., Baird, W., & Hildyard, A. (1982). That's important but is it interesting? Two factors in text processing. In A. Flammer & W. Kintsch (Eds.), *Discourse processing* (pp. 63-75). NY: North Holland.

Kintsch, W. (1980). Learning from text, levels of comprehension or: Why anyone would read a story anyway. *Poetics, 9,* 87-98.

Schank, R.C. (1979). Interestingness: Controlling inferences. *Artificial Intelligence, 12,* 273-297.

Related References:

Asher, S.R. (1980). Topic interest and children's reading comprehension. In R.J. Spiro, B.C. Bruce, & W.F. Brewer (Eds.), *Theoretical issues in reading comprehension* (pp. 525-534). Hillsdale, NJ: Erlbaum.

Baldwin, R.S., Peleg-Bruckner, Z., & McClintock, A.H. (1985). Effects of topic interest and prior knowledge on reading comprehension. *Reading Research Quarterly, 20,* 497-504.

Iran-Nejad, A. (1987). Cognitive and affective causes of interest and liking. *Journal of Educational Psychology, 79,* 120-130.

Example Study Abstracts:

1. Hidi, S., & Baird, W. (1988). Strategies for increasing text-based interest and students' recall of expository texts. *Reading Research Quarterly, 23,* 465-481.

Hidi and Baird (1988) prepared three versions of a sample text to investigate variables which may increase learning from interesting exposition. The base text incorporated the four attributes suggested by Anderson et al. (1986): character identification, novelty, life theme, and activity level. The second version consisted of "salient descriptive elaborations" of selected facts to the base text (salient text). The third version varied the order of presentation so that readers would experience an incomplete understanding of new information and a subsequent need to resolve their lack of understanding (resolution text). Forty-four fourth-graders and 66 sixth-graders read one of the three versions and then completed a free written recall both 15 minutes after reading the text and again one week later. Sentences that described "active, personally involving experiences" of the characters in the text (p. 478) were found to produce higher recall. Similarly, salient elaborations were recalled more often, particularly when related to concrete, personal activities as opposed to abstract, scientific information. The resolution text failed to generate a significant difference in recall among the three versions. A forced-choice task among a separate group of 36 fourth- and sixth-graders revealed no significant differences among the three versions in rated level of interest.

Title: CONTENT MOTIVATION

Definition: Content motives refer to motives directed towards specific content areas or subject-matter oriented interests which vary within learning situations.

Constituent and Related Constructs:

1. ***Intrinsic Motivation***
2. ***Interestingness/Text-based interest***
3. ***Interest***

Theoretical Base:

Nenniger (1987) describes a content motive in learning as "an enduring, highly general and very stable personality trait that determines the person's sensitivity to situational determinants" (p. 159). He contrasts content motives with achievement motives which he refers to as "highly general and a very stable result of the socialization process" (p. 159). Content motives suggest that rather than consider motives as independent variables which affect learning, motives may need to be considered as variables which can be modified.

Assessment Procedures:

In the two studies described, Nenniger (1987) used a questionnaire which assessed "content-oriented motive" towards mathematics. Two dimensions were measured: (a) interest in mathematics, and (b) readiness for work in mathematics. He gave no other information about the content or development of the questionnaire.

Issues for Construct Validation:

1. How does content motivation differ from situational interest? Construct validation work needs to distinguish this construct from related interest and motivational constructs.

Key References:

Nenniger, P. (1987). How stable is motivation by contents? In E. de Corte, H. Lodwijks, R. Parmentier, & P. Span (Eds.), *Learning and instruction: European research in an international context* (Vol. 1., pp. 159-179). London: Pergamon Press.

Nenniger, P. (in press). Task motivation: An interaction between the cognitive and the content oriented dimensions in learning. In K.A. Renninger, S. Hidi, & A. Krapp (Eds.),

The role of interest in learning and development. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Example Study Abstracts:

1. Nenniger, P. (1987). How stable is motivation by contents? In E. de Corte, H. Lodwijks, R. Parmentier, & P. Span (Eds.), *Learning and instruction: European research in an international context* (Vol. 1). London: Pergamon Press.

Nenniger (1987) describes three related studies in which 312 12-13 year-olds participated in a two-week introductory course in geometry. Two experimental conditions were used in which two new methods of geometry instruction and one control group that used the traditional method of teaching geometry. Measures of motivation and cognitive learning (performance) were taken at the beginning of the course, after one week, and at the end of the course. Additional measures were taken three months after the instruction ended.

a) The first study found transitory changes in content-oriented motives. Changes in motives existed during and at the end of the instruction, but after three months, they had returned to their original level.

b) The second study found a progressive decrease in interest for the experimental conditions during the two-week course and a large drop in interest during the first week of the traditional course. Interest in the traditional course did not return to its initial level throughout the remainder of the course.

c) The third study examined the relationship between causal attributions and strength of the content motive. It found that instructional conditions had little effect on the relationship between motive development and causal attributions. The relationship between these two factors result mainly from the development of interest.

Title: LEARNING STYLES

Definition: Learning styles refer to the characteristic ways in which individuals prefer to learn. Individual differences in style include variations in the type and extent of cognitive processing preferred in learning a given task, coupled with the preferences for particular environmental and social conditions in which learning is undertaken. This definition attempts to encompass both the various learning style instruments classified by Curry (1990), and also the review and definition offered by Keefe (1987, 1988).

Constituent and Related Constructs:

There is a long list of learning style constructs and constituents (Curry, 1990; Keefe, 1987; Schmeck, 1988). Keefe (1987), for example, lists 33 different constructs, classified as cognitive, affective, or physiological, and within these categories as representing other major distinctions such as perception vs. concept formation and retention styles or attention vs. expectancy and incentive styles. Included in most lists are well known cognitive style distinctions such as field independence vs. dependence and reflection vs. impulsivity, but also dimensions of temperament such as achievement motivation and anxiety, and sometimes ability constructs such as spatial visualization. The physiological category might include preferences for work during a certain daily time period or at a certain tempo. Because of this heterogeneity, we do not list all these constructs as constituents of learning style here; there is as yet no broad correlational or analytic justification for this. Rather, we view style as a category of ideas about individual differences in personal style and simply list the different assessment procedures and instruments used, with examples, below. We would encourage much more emphasis on theoretical clarification and educational validational research in the future than is evident at present.

Theoretical Base:

There is much confusion as to what exactly constitutes a style, as opposed to an ability or temperamental characteristic. There is also substantial evidence that some of the more widely known style constructs, notably field independence, cannot be reliably distinguished from abilities (Cronbach, 1990; McKenna, 1984, 1990). On the other hand, despite much controversy over the years, there is persistent research advocating some old style distinctions (e.g., verbalizer vs. visualizer; see Richardson, 1977, and Cohen & Saslona, 1990), and proposing new distinctions (e.g., holist vs. serialist; see Pask, 1976, and Pask & Scott, 1972). There are also new conceptualizations of styles that represent bridging constructs or mixtures of ability and personality (Messick, 1987) and new emphases on identifying the strategic differences in actual learning activities that may reflect more pervasive style differences (Entwistle, 1987; Marton, Hounsell, & Entwistle 1984).

Different style constructs will need different theoretical frameworks and approaches to validation because they exist in different networks of associated constructs and evidence. If there is to be a common theoretical base for the concept of style, perhaps it will be found in an integrated model of person-situation interaction and adaptation. If learning style is an amalgam of preferences and habits that describe various aspects of specific learning situations and the learner's perceptions of these, then it is also a description of situations and person-situation match (see Snow, 1992).

Assessment Methods:

The instruments listed below are categorized according to response format. Each relates to somewhat different aspects of learning style. Some measures aim at only one construct; others include scales for many aspects of the style concept. Measures not otherwise referenced may be found described in Curry (1990).

1. Likert Scale Self-Report

a) Biggs: Learning Process Questionnaire (LPQ)
b) Entwistle & Ramsden: Approaches to Studying
c) Grasha & Riechman: Student Learning Scales (GRSLSS)

2. True - False Self Report

a) Dunn, Dunn, & Price: Learning Style Inventory (LSI)
b) Schmeck, Ribich, & Ramanaiah: Inventory of Learning Process (ILP)

3. Forced Choice/Multiple Choice Preferences

a) Keefe & Monk: NASSP Learning Style Profile
b) Myers-Briggs: Myers-Briggs Type Indicator

4. Rank Order of Preferences

a) Kolb: i) Learning Style Inventory
    ii) Adaptive Style Inventory
b) Rezler & Rezmovic: Learning Preference Inventory

5. Written Completion of Sentence Stems

a) Hunt: Paragraph Completion Method
b) Schroder: Paragraph Completion Test

6. Visual Maximum Performance Task

a) Kagan: Matching Familiar Figures Test
b) Witkin Embedded Figures Test
c) Witkin Group Embedded Figures Test
d) Witkin Rod and Frame Test

Issues for Construct Validation:

1. Theoretical attention must be directed towards the variety of ways in which Learning Style has been conceptualized. The various measures are heterogeneous and, for the most part, inadequately evaluated.

2. The conceptual model would imply that attitudes, interests, and motivation, in addition to cognitive achievement, should be influenced by matching learning environments with individual styles. This is a question for empirical research using the aptitude-treatment interaction approach advocated by Cronbach and Snow (1977). To date, no learning style construct has been validated this way.

Key References:

Curry, L. (1990). *Learning styles in secondary schools: A review of instruments and implications for their use.*

Keefe, J.W., & Monk, J.S. (1988). *Learning style profile technical manual.* Reston, VA: National Association of Secondary School Principals.

Schmeck, R.R. (Ed.). (1988). *Learning strategies and learning styles.* New York: Plenum.

Related References

Corno, L., & Snow, R.E. (1986). Adapting teaching to individual differences among learners. In M.C. Wittrock, (Ed.) *Handbook of research on teaching*, (3rd ed., pp. 605-629). Washington, DC: American Educational Research Association.

Cronbach, L.J., & Snow, R.E. (1977). *Aptitudes and instructional methods: A handbook for research on interactions.* New York: Irvington.

Curry, L. (1983). *An organization of learning styles, theories and constructs.* Paper presented at the annual meeting of the American Educational Research Association, Montreal, Canada.

Entwistle, N. (1981). *Styles of learning and teaching.* Chichester: Wiley.

Messer, S.B. (1976). Reflection-impulsivity: A review. *Psychological Bulletin, 83*, 1026-1052.

Messick, S. (1984). The nature of cognitive styles: Problems and promise in educational practice. *Educational Psychologist, 19*, 59-75.

Pask, G. (1976). Styles and strategies of learning. *British Journal of Educational Psychology, 46*, 128-148.

Pask, G., & Scott, B.C.E. (1972). Learning strategies and individual competence. *International Journal of Man-Machine Studies, 4*, 217-253.

Schmeck, R.R. (1988). *Learning strategies and learning styles*. New York: Plenum Press.

Shipman, S., & Shipman, V.C. (1985). Cognitive styles: Some conceptual, methodological, and applied issues. In E.W. Gordon (Ed.), *Review of research in education*. Washington, DC: American Educational Research Association.

Snow, R.E. (1986). Individual differences and the design of educational programs, *American Psychologist*, October, 1029-1039.

Snow, R.E. (1992). Aptitude theory: Yesterday, today, and tomorrow. *Educational Psychologist, 27*, 5-32

Wang, M.C., & Lindvall, C.M. (1984). Individual differences and school learning environments. In E.W. Gordon (Ed.), *Review of research in education*. Washington, DC: American Educational Research Association.

Weinstein, C.W., Goetz, E.T., & Alexander, P.A. (Eds.). (1988). *Learning and study strategies: Issues in assessment, instruction and evaluation*. San Diego, CA: Academic Press.

Witken, H.A., Moore, C.A., Goodenough, D.R., & Kox, P.W. (1977). Field dependent and field independent cognitive styles and their educational implications. *Review of Educational Research, 47*, 1-64.

Title: MOTIVATED STRATEGIES FOR LEARNING

Definition: Learning strategies are particular information processing activities habitually applied in learning situations with the aim of promoting more efficient learning or problem solving (Weinstein, Goetz, & Alexander, 1988). Some are described as fairly general and pervasive preferences and habits indistinguishable from learning styles. Others appear quite specific and perhaps are better described as tactics. Motivated strategies (Pintrich et al., 1988) for learning are the cognitive and metacognitive strategies used under the influence of particular motivational orientations.

Constituent and Related Constructs:

The ***Motivated Strategies for Learning Questionnaire*** consists of these scales:

1. **Task Value:**
   a) interest
   b) importance
   c) utility

2. **Control beliefs:**
   a) internal attributions for success or failure
   b) external attributions for success or failure

3. **Test Anxiety:**
   a) cognitive interference
   b) emotionality

4. **Metacognition:**
   a) planning
   b) monitoring
   c) regulating

The ***Learning and Study Strategies Inventory*** (Weinstein, Zimmerman, & Palmer, 1988) consists of ten constituent scales:

1. Anxiety
2. Attitude
3. Concentration
4. Information Processing
5. Motivation
6. Schooling
7. Selecting Main Idea
8. Self-Testing

9. Study Aids
10. Test Strategies

Other related constructs can easily be listed, since both lists contain scales that reference motivational, temperamental, stylistic, and cognitive aspects of learning. Of particular importance, however, are metacognitive concomitants of learning and problem solving, since the strategies that have received the most theoretical and empirical attention are those concerned with self-regulation, mindfulness, and thus with the volitional domain in general.

Theoretical Base:

As noted above, learning strategy constructs range along a continuum of implied stability from general styles to specific tactics. Yet it is assumed that strategies can be taught and that doing so will improve student learning. The research on this issue is mixed but there have been some notable successes (for reviews, see O'Neil, 1978; O'Neil & Spielberger, 1979; Brown & Campione, 1986; Weinstein, Goetz, & Alexander, 1988). Quite likely, some strategies are readily learned for use in particular appropriate situations, whereas others are manifestations of deep seated ability or personality structures.

Assessment Procedures:

1. The ***Motivated Strategies for Learning Questionnaire*** is an instrument asking students to rate themselves using a 7-point Likert scale on 105 items. The motivation section consists of 40 items that assess students' value for a course, their beliefs about their skill to succeed in the course and their anxiety about tests in the course. The learning strategy section includes 45 items regarding students' use of different cognitive and metacognitive strategies and 21 items concerning management of different resources. (Pintrich et al., 1988)

2. The ***Learning and Study Strategies Inventory*** consists of 90 Likert scale self-report items distributed unevenly across the ten scales. It displays adequate reliability (stability) for use in providing individualized prescriptions in a learning skills course (Weinstein et al., 1988).

3. The ***Inventory of Learning Processes*** (Schmeck et al., 1977) is a 62-item true/false measure of behavioral indicators related to everyday studying. The framework underlying the ILP is comes from the notion of levels of processing in memory (Craik & Lockhart, 1972), and includes a distinction between deep vs. surface levels of processing. A *deep approach* describes the degree to which a student evaluates, organizes, and identifies similarities and draws distinctions in the information being studied. Other factors measured by the inventory include *elaborative processing*, *fact retention*, and *methodical study*. Validity evidence for the ILP is reported by Schmeck (1983).

4. The ***Approaches to Studying Inventory*** developed from research reported in the *Experience of Learning* (Marton et al., 1984). The Approaches to Studying Inventory is a 64-item likert scale measure of study orientations. Four main orientations to studying emerged in factor analyses of the inventory. These factors were combinations of approaches to learning, motivational constructs, and learning styles and consisted of achieving (with loadings on strategic approach, hope for success, and vocational motivation), meaning (deep approach and intrinsic motivation), reproducing (surface approach and fear of failure) and non-academic (disorganized study methods, negative attitudes, and social motivation). Three approaches to learning form the basis of the inventory. In contrast to Schmeck, Marton chose to distinguish deep vs. surface approach in terms of intentionality (Marton & Säljö, 1984). A deep approach is associated with an intention to understand, whereas a surface approach involves the intention to reproduce information to satisfy externally imposed demands. Ramsden (1981) identified a third approach that is included in the inventory. A strategic approach is involved when students seek to maximize their grades by strategically managing their time, effort and intellectual resources in the service of obtaining higher grades. Entwistle and Waterson (1988) report a study comparing the Schmeck and Marton inventories that found close correspondence between them.

Issues for Construct Validation:

1. Some items in each instrument, particularly in the metacognition and critical thinking components appear to be interrelated and could appear under other headings. What are the correlations among the subscales? How are they related in the theoretical framework? How do the authors distinguish among them? Might hierarchical factor models simplify and clarify the constituent constructs? How might "strategy" be distinguished from "ability" and "personality" in such models?

2. What are the correlations among the scales of these instruments and between them and other relevant measures in the volitional domain?

3. How does the theoretical framework underlying these instruments compare with other models for learning strategies such as those proposed by Corno (1989) or Dansereau (1985).

4. Both instruments were developed primarily to assess the effectiveness of college level courses teaching these strategies. The instruments aim at finding out what strategies are used by students, their motivational orientations for a particular course, etc. Are the strategies assessed likely to be used in the same way in different courses or in the same course with different instructors or different kinds of course evaluation schemas or learning activities? To what extent do they measure the situated use of strategies vs. the style of strategy use by students? Are they useful at other educational levels?

Key References:

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Schmeck, R.R. (1983). Learning styles of college students. In R. Dillon & R.R. Schmeck (Eds.), *Individual difference in cognition.* New York: Academic Press.

Schmeck, R.R., Ribich, R.D., & Ramanaiah, N. (1977). Development of a self-report inventory for assessing individual differences in learning processes. *Applied Psychological Measurement,* 413-431.

Example Study Abstracts:

1. Karabenick, S.A. (1988). *Varieties of help-seeking as a learning strategy and the role of self-esteem threat.* Paper presented at the annual meeting of the American Psychological Association, Atlanta, GA, August 12-16.

   Previous research has shown that seeking help is an important and ubiquitous behavior in higher education. However, relatively little is known about the person and situation determinants of academic help-seeking. This study was designed to differentiate types of help-seeking and examine sources of help and goals. Students (N=386) in biology, English literature, and social sciences courses at four types of institutions of higher education provided data. Data were collected at the beginning and end of the academic term. Students who used more help-seeking and other strategies also sought help more when required. Students who engaged in rehearsal (rote processes of repetition, recopying, and memorization) were more likely to seek help from fellow students than from instructors or study skills personnel. Conversely, students who engaged in the more complex strategies of critical and original thinking were more likely to utilize formal rather than informal sources. In general, the role of threat to self-esteem was more highly related to resource management and lower complexity cognitive strategies (rehearsal) than to more complex strategies (critical and original thinking).

2. Pintrich, P.R. (1988). Student learning and college teaching. *New directions for teaching and learning, college teaching and learning: Preparing for new commitments, 33*, 71-86.

Current research on college students' knowledge, learning strategies, and critical thinking gives a better picture of the complexity of the learning process and can be used by faculty to improve interactions with individual students in different settings. (MSE)

3. Pintrich, P.R. (1988). A process-oriented view of student motivation and cognition. *New directions for institutional research, No. 57 (Improving teaching and learning through research)*, *15*, 65-79.

   Assessment programs designed to improve instruction should be based on strong theoretical models of student learning, motivation, and instruction. A taxonomy of learning strategies is provided.

4. Karabenick, S.A. (1987). *Cognitive learning strategies: Their relation to perceived need and help-seeking behavior*. Paper presented at the annual convention of the American Psychological Association, New York, August 28-September 1.

   The American culture's emphasis on individualism may fail to recognize that help-seeking can be an important proactive skill in the achievement domains of school and work. While research has shown that the majority of students obtain some help from peers or instructors, the study of help-seeking as a learning strategy has been virtually neglected. This study examined how help-seeking relates to cognitive learning strategies such as elaboration, metacognition, and resource management. Data were obtained from students in biology, English literature, and social science courses at four different types of higher educational institutions. Strategy use and help-seeking information were obtained using the Motivated Strategies for Learning Questionnaire. The use of 10 cognitive strategies was assessed: rehearsal; elaboration; memory techniques; organization; metacognitive techniques of planning, monitoring, and regulating; and resource management of one's time, study environment, and self. The results indicated that students who used various cognitive strategies were also more likely to seek help when needed. This supports the view that seeking help is an alternative means of goal accomplishment to be used when the need arises. Students who were less likely to use various strategies were also less likely to seek the help they needed.

5. Pintrich, P.R. et al. (1987). Teaching a course in learning to learn. *Teaching of Psychology*, *14*, 81-86.

   Describes an undergraduate course which provides instruction in theory and research in cognitive psychology and in the application of learning strategies for studying. Topics covered in the course include learning from lectures, texts, and discussions; memory models and strategies; motivation; writing skills; test-taking strategies; problem solving; and self-management.

6. Berger, C.F. & Pintrich, P.R. (1987). Attainment of skill in using acience processes. II: Grade and task effects. *Journal of Research in Science Teaching*, *23*, 739-747

   Uses two studies to examine developmental and task effects in estimation problems. Results are discussed in terms of student and task characteristics and the implications of such variables on information processing model of learning. Implications for science teaching, learning problem diagnostics, and science curricula are also discussed.

IV. SELF-RELATED CONCEPTS

Title: SELF-CONCEPTS

Definition: Self-concepts are the self-perceptions people hold about themselves. Emphasis in the self-concepts is on persons as objects of their own self-knowledge, especially the cognitive and conscious aspects of this. Feelings about how persons perceive and evaluate themselves are also often included. (Cardona, 1979; English & Champney, 1958).

Constituent and Related Constructs:

Self concept is a multidimensional construct whose interpretation may be broad or narrow depending on the author's purposes. It comprises or is closely related to the following: self-esteem (worth, value, satisfaction); self-confidence, self-image (mental picture); self-respect; self-determination (will, freedom from boundedness); self-crystallization; stability of the self; self-efficacy beliefs (personal agency beliefs; origins vs. pawns); locus of control/locus of causality; intrinsic vs. extrinsic motivation; autonomy vs. external control, self-evaluation (automatic thoughts, acceptance/ awareness). Also, cognitive processes such as reflection, memory, evaluation, perception and social psychological concepts such as selective perception, attribution, and dissonance are sometimes included.

While acknowledging the fuzzy boundaries among the self-constructs, we prefer to distinguish ***self-concept*** from ***self-esteem***. Self-concept is an individual's self-knowledge (e.g., "I can read well"), whereas self-esteem is an individual's perceived sense of self-worth and self-respect that has an affective quality associated with it (e.g., "I feel good about how I look"). In contrast to self-concept and self-esteem, ***self-confidence*** usually refers to individuals' beliefs about their abilities to complete a given task and accomplish goals. As such, self-confidence can be equated with Bandura's (1977) self-efficacy, especially when applied to particular tasks or goals. Another aspect of self is its ***stability***, that is, how easily can self-perceptions be changed?

Theoretical Base:

Research on self-concept has been popular because of widespread belief that improvements in self-concept will lead to improvements in adjustment and achievement. However, much of the earlier work lacked a theoretical basis, used poor quality measuring instruments, contained methodological shortcomings, and found inconsistent results (Wylie, 1974).

Self-concept research has steadily moved from a unidimensional conception of self-concept towards a progressively more differentiated and multidimensional conception. Recent work by Marsh & Shavelson (1985) suggests that self-concept is hierarchically organized, with self-concept for particular domains or tasks located at the bottom (equivalent to self-efficacy), more general self-concepts in the middle levels (such as mathematical self-concept), and general self-concept located at the top of the hierarchy.

Self-concept is generally acknowledged as originating socially. Through contacts with others in the context of culture, one adopts views or perceptions of one's self that are mediated by both these others and the culture. Thus, one's sense or concept of self is primarily socially constructed, both as a function of the subject's influence on the context and vice versa.

As to what, specifically, influences self-concept, some evidence suggests that the evaluatory opinions of people of significant stature in the estimation of children can strongly affect them. Ethnic identity, gender, and a whole panoply of social and cultural values have been implicated among the influences on self-concept. (Wylie, 1974; Healey, 1969). For a review of social context effects on self-concept, see Marsh (1990).

Burns (1982) sees self-concept as a compound of self-image and self-evaluation, and thus "places the self-concept within the ambit of attitude study." Such study "entails three essential ingredients: (a) a belief which may or may not be valid, (b) an emotional and evaluative connotation around that belief, and (c) a consequent likelihood of responding or behaving in a particular way" (1982, p. 3).

According to another view, self-concept involves a pursuit of "inner consistency" that causes one to act in accord with one's view of one's self. Additionally, it affects one's "interpretation of new experiences" on the basis of previous experiences that lead to a pattern of "expectations that establish conditions on how others will respond" (Samuels, 1977). It is hypothesized, within this view, that children with the benefit of good self concept, derived from a warm and supportive early childhood experience, will withstand the difficulties of school, while those without such benefits will attribute their difficulties to personal inadequacies evident to the child in her self concept and thus impede her school progress. It can be argued that the students' entry into the radically new realm of school is perceived by them as per force entry into a world built around the determinations, definitions and expectations of others; because of its discontinuity with previous life experiences, the children are dependent on authoritative others to direct and interpret their experiences. Entirely new systems of evaluation, reward and motivation are part of this experience. Also part of this experience are judgments that are likely to affect the students' self-concept, particularly as it derives from sense of personal agency, self-efficacy, intrinsic motivation, etc.

Self-concept is at all times available to the child for use in determining, evaluating and attributing behavior and its consequences. It is therefore an always-present lens through which individuals view and understand their relations in the world.

Assessment Procedures:

There are many self-concept measures that could be included here (see Wylie, 1974; 1990 for a review), but Marsh's (1988) and Harter's (1985; 1986; 1988) are generally preferred because of their breadth. Purkey (1970, 1983) discusses the educational relevance of self-concept and the characteristics of students who have high self-concepts as learners.

1. Marsh's (1988) Self Description Questionnaires operationalize the hierarchical model of self-concept described earlier. They have been developed for preadolescents (SDQI), adolescents (SDQII), and late-adolescents and young adults (SDQIII). Scales include Physical abilities, Physical appearance, Peer relationships, Opposite sex relationships, Same sex relationships, Honesty/trustworthiness, Parent relationships, Spiritual

values/religion, Emotional stability, General, Read/verbal, Math, School, Problem Solving, although not all scales are included in the instruments for younger respondents (SDQI and SDQII). The individual scales appear highly internally consistent (median $r_{tt} = 0.90$), stable over a 1-month interval (median $r = 0.87$), reasonably stable over a longer interval of 18 months (median $r = .74$). Interestingly, the most general scale, General Self-Concept, had the lowest long-term stability (median $r = 0.51$), indicating that it may be more sensitive to short-term effects such as mood fluctuations. The multidimensional structure of the SDQ instruments has been supported by factor analyses conducted on over 12,200 sets of responses.

2. Harter's (1985) Self-Perception Profiles for Children, Adolescents, and Adults (Messer & Harter, 1986) are multidimensional measures of domain-specific judgments of competence as well as global perceptions of their self-esteem. The children's profile contains the following scales: scholastic competence, social acceptance, athletic competence, physical appearance, behavioral conduct, and global self-worth. The adolescent profile contains: scholastic competence, social acceptance, athletic competence, physical appearance, job competence, romantic appeal, behavioral conduct, close friendship, and global self-worth. The adult profile contains scales for: sociability, job competence, nurturance, athletic abilities, physical appearance, adequate provider, morality, household management, intimate relationships, intelligence, sense of humor, and global self worth.

3. Origin Climate Questionnaire (deCharms, 1976). Self-report measure of the degree to which children perceive the classroom climate as fostering "origin" or "pawn" orientations. "deCharms conceptualized the origin climate as one where autonomy and acceptance are afforded within the context of a firm, consistent culture." It is a multidetermined phenomenon that is heavily determined by teacher style and orientation (Ryan & Grolnick, 1986).

Issues for Construct Validation:

1. What is the relationship between general self-concept and specific aspects of the self concept?

2. How does self-concept develop? How does self-concept evolve and generalize in younger children? At what age does general self-concept develop?

3. Do academic self-concepts have a significant effect on academic achievement—or is it the other way around—or both? Longitudinal panel designs with multiple measurement occasions for self-concept and achievement would be useful here.

4. How does one's frame of reference or context influence self-concept?

5. To what extent are measures of self-concept and self-esteem contaminated with response style variance such as that due to social desirability? What are some of the problems of measuring self-referent constructs in general?

Key References:

Harter, S. (1985). *Manual for the self-perception profile for children.* Denver, CO: University of Denver.

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Marsh, H.W. (1988). *Self-Description Questionnaire: A theoretical and empirical basis for the measurement of multiple dimensions of preadolescent self-concept: A test manual and a research monograph.* San Antonio, TX: The Psychological Corporation.

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Related References:

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*, 191-215.

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Ryan, R.R., & Grolnick, W.S. (1986). Origins and pawns in the classroom: Self-report and projective assessments of individual differences in children's perception. *Journal of Personality and Social Psychology, 50*, 550-558.

Samuels, S.C. (1977). *Enhancing self concept in early childhood.* New York: Human Science Press.

Title: PERCEIVED SELF-EFFICACY

Definition: Perceived self-efficacy is defined as persons' judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses (Bandura, 1986, p. 391).

Constituent and Related Constructs:

The earlier discussion of constituent and related concepts of self-concept is relevant here because self-efficacy is found in the same network of constructs. Self-efficacy judgments can be applied to a wide variety of domains.

Theoretical Base:

1. ***Social Cognitive Theory***. Perceived self-efficacy results from diverse sources of information conveyed vicariously and through social evaluation, as well as through direct experience. Self-percepts of efficacy are not simply inert estimates of future action. People's beliefs about their operative capabilities function as one set of proximal determinants of how they behave, their thought patterns, and the emotional reactions they experience in taxing situations. Such self-referent thoughts mediate the relationship between knowledge and action and thus contribute to the quality of psychosocial functioning (Bandura,1981a).

2. Related views of personal efficacy:

    a) Self-Concept (Wylie, 1974)
    b) Effectance Motivation (Harter, 1978)
    c) Outcome-Expectancy theories (Feather, 1982)

Assessment Procedures:

There is no all-purpose measure of perceived self-efficacy. Scales of perceived efficacy are tailored to the particular domain of psychological functioning that is the object of interest (Bandura, 1986, p. 396).

In a particular domain, for example, computer self-efficacy, subjects are asked to rate how confident they are in performing tasks relating to computers. Subjects rate the degree of confidence in terms of how well they think they would do if they were asked to perform each task right now by recording a number from 0 to 100 using the following scale:

Confidence Scale

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately certain can do					Certain can do

For practice, subjects are asked to rate how confident they are if they are asked to lift objects of different weights right now. Perceived self-efficacy is computed by dividing the total confidence ratings by the number of tasks. If more than one section of tasks is listed, the scores from all sections are then combined into an overall self-efficacy composite score.

Issues for Construct Validation:

1. Is there consistency and congruence between self-efficacy and performance (Telch, 1982)?
2. What is the relationship between self-efficacy judgment and action (Bandura, 1986, p. 395)?
3. What are the relationships of computer self-efficacy to other variables such as computer, math, state, trait, and test anxiety (Tsai, 1988)?
4. Are there other ways to measure self-efficacy besides paper-and pencil response formats? What about observational methods?

Key References:

Bandura, A. (1986). *Social foundations of thoughts and actions*. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Miura , I.T. (1987). The relationship of computer self-efficacy expectations to computer interest and course enrollment in college. *Sex Roles*, *16*, 303-311.

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Telch, M.J., Bandura, A., Vinciguerra, P., Agras, A., & Stout, A.L. (1982). Social demand for consistency and congruence between self-efficacy and performance. *Behavior Therapy, 13*, 694-701.

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Example Study Abstract:

1. Miura , I.T. (1987). The relationship of computer self-efficacy expectations to computer interest and course enrollment in college. *Sex Roles, 16*, 303-311.

   Gender differences in perceived self-efficacy for computer use may help account for differential computer interest and course enrollment at the college level. Three hundred sixty-eight students completed a two-paged questionnaire assessing perceived computer self-efficacy, skills, and interest in learning about computers. Men rated themselves higher than did women for perceived measures, but with computer self-efficacy held constant, the magnitude of these differences was decreased, suggesting that perceived self-efficacy may be an important consideration when examining gender differences in computer interest and use (Miura, 1987).

Title: PERSONAL AGENCY BELIEFS

Definition: Personal agency beliefs provide information which is useful in deciding whether to activate or inhibit goal-directed behavior (Ford & Thompson, 1985). They consist of a mixture of self-referent beliefs regarding one's own competence and also beliefs about the responsivity of the environment.

Constituent and Related Constructs:

There are two separate components to personal agency beliefs: perceptions of control and perceptions of competence. Perceptions of control are beliefs about the responsiveness of the environment to one's efforts to attain desired outcomes. Perceptions of competence are beliefs about one's own ability to achieve a desired outcome given appropriate circumstances.

Assessment Procedure:

A paper-and-pencil measure is currently under development (The Assessment of Personal Agency Beliefs) and copies are available from Martin Ford, School of Education, Stanford University.

Theoretical Base:

Personal agency beliefs are components of Ford & Ford's (1987) living systems framework, an integrated system of components that describe how individuals' "goals, emotions, thoughts, actions and biological processes function both semi-autonomously and as a part of a larger unit (the person) in coherent "chunks" of context-specific, goal-directed activity (behavior episodes)" (Ford & Ford, 1987, p. 1) Personal agency beliefs are similar to self-efficacy judgments, except they also include beliefs about the responsivity of the environment to achieving one's goals.

Issues for Construct Validation:

1. What differences exist between personal agency beliefs and self-efficacy judgments? Can they be distinctively measured and validated for specific uses?

Key References:

Ford, M.E., & Ford, D.H. (1987). *Humans as self-constructing living systems*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Ford, M.E., & Thompson, R.A. (1985). Perceptions of personal agency and infant attachment: Toward a life-span perspective on competence development. *International Journal of Behavioral Development, 8*, 377-406.

Related References:

Bandura, A. (1986). *Social foundations of thoughts and actions*. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Example Study Abstract:

1. Ford, M.E., & Thompson, R.A. (1985). Perceptions of personal agency and infant attachment: Toward a life-span perspective on competence development. *International Journal of Behavioral Development, 8*, 377-406.

   Sketches the outlines of a life-span perspective on competence development, which focuses on beliefs about one's potential for producing desirable outcomes. The paper is concerned with the nature and implications of individual differences in perceptions of personal agency and likely origins and development of the perceptions in the early years.

V. OTHER-RELATED CONCEPTS

Title: PERSUASIBILITY

Definition: Hovland and Janis (1962) define persuasibility as any variable attribute within a population that is correlated with consistent individual differences in sensitivity to one or more classes of influential communications. Influential communications can be in the form of film, speech, or discussion as well as text aimed at challenging individuals' opinions and eventually changing them.

Related Constructs:

1. Strength and extremity of opinions
2. Knowledge about the issues which is the focus of persuasion
3. Self-Esteem
4. Personality differences related to rigidity and conformity
5. Confidence

Theoretical Base:

Individual persuasibility is one of the factors that can influence attitude change. The term "attitude change" is used when there are indications that the individual has internalized a message, as evidenced by the fact that the person's perceptions, feelings, and overt actions, as well as verbalized judgments, are changed. When there is evidence of a genuine change in a verbalized belief or value judgment, the term "opinion change" is used. Almost all studies on the effects of persuasive communications have been limited to investigating changes in opinion. The reason is that such changes can easily be assessed in a highly reliable way whereas other components of verbalizable attitudes are much more difficult to measure.

Many theorists argue that "established" opinions are more difficult to change (Anderson & Hovland, 1957; Cantril, 1946; Hovland, 1972; Roberts, 1972; Saltiel & Woelfel, 1957). Two theories have been advanced to explain such a finding. Cantril (1946) argues for a polarity effect, that is, the more extreme the opinion, the greater its resistance to change. Hovland (1972) and Anderson and Hovland (1957) argue that the greater resistance to change stems from the greater amount of information that individuals have for established opinions.

The basic assumption in information processing theory is that an individual reacts to a communication or a set of messages by breaking it into component messages, arguments, or assertions about the object being described. The individual then compares each argument or assertion with her/his own corresponding opinion. If an assertion is different from the individual's opinion, then the individual may either reject the message or yield to the argument. Yielding leads to opinion change. This can induce corresponding attitude change. Thus only if the individual initially disagrees with a message will there be any attitude change. The attitude change that does occur is either in the direction of the values implied by the message or in the opposite direction. When the change is in the opposite direction the attitude change is in the form of strengthening initial opinion.

From an information-processing perspective, attitude change is the product of new information. This perspective suggests that, there are a number of reasons why individuals may not change their attitudes even though they are presented with new information that challenges their existing evaluation of an attitude object. One barrier is that there may be defects in the understanding of new information by individuals. This idea was developed in detail by McGuire (1972), who argued that attitude change is a product of three sequential processes. According to McGuire, in order for attitude change to take place, individuals must first pay attention to the information. Then they must comprehend the information to which they have attended. Next, they must personally accept or yield to the information that they have comprehended. From McGuire's perspective, failures or defects at any of these stages diminish or prevent attitude change. A more recent summary from McGuire's perspective can be found in McGuire (1985).

Assessment Procedures:

Attitudes are commonly measured using classical Thurstone scale and Likert scale procedures, but these depict persuasibility only as attitude score change over time. One new assessment procedure being developed is a branching test-questionnaire design, using dichotomous knowledge items, attitude items and challenges. Attitude items are representative of each attribute on different themes. The instrument consists of a number of theme sections. In each theme section there are one opinion item, two challenges (only one of which is presented each time), and two knowledge items.

An example of a theme section will is as follows:

Everyone who wants to live in the U.S. should be allowed to do so.

Agree		Disagree	
Would you still feel this way even if this could increase unemployment in the U.S.?		Would you still feel this way given the fact that the majority of people in this country are descendants of immigrants themselves?	
Yes	No	Yes	No

Issues for Construct Validation:

1. Is change of opinion an indication of persuasibility ?

2. Is change of opinion after challenges simply a function of measurement error?

3. What personality factors influence persuasibility?

4. What knowledge factors influence persuasibility?

5. How do response styles such as social desirability respondent affect persuasibility measures?

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Title: CONCEPTUAL STRUCTURE

Definition: Conceptual structure is "a hypothetical construct referring to the organization (relationships) of concepts in long-term memory" (Shavelson, 1972, pp. 226-227).

Constituent and Related Constructs:

Although some authors use the term "cognitive structure," we think this term overgeneralizes because there can be many different kinds of cognitive structures. Related constructs are schema, script, and mental model. Most of the research concerns associative networks among concept terms. Also one can think of affective structures—associative networks of attitude terms.

Theoretical Base:

The cognitive revolution in the beginning of the 1970's was marked by the development of new structural representations of the contents of long term memory (LTM). Among these were semantic networks (Rumelhart & Norman, 1988). Semantic networks describe LTM as consisting of nodes and links. Nodes represent entities in the world, and links consist of the relationships among the entities. According to the underlying theoretical framework, information processing by humans depends on the identity and structure of the links. Incoming information is able to activate certain nodes. Storage consists of the modification of the nodes and links that are close to those activated by the new incoming information. The process of information retrieval can be thought of as a spreading of activation from node to node through the links (Anderson, 1980).

Ausubel (1968) argued that humans only acquire new knowledge on the basis of their prior knowledge. The implication is that it is of great value to have a detailed description of a student's knowledge base at any moment, not only for assessing instructional outcomes, but also to aid in designing appropriate instructional interventions. The educational relevance of the theory of semantic networks is that it attempts to explain how humans acquire new knowledge on the basis of their prior knowledge, and it provides a format for describing knowledge and its modification in the course of instruction.

Assessment Procedures:

If a student perceives a stimulus that corresponds to a node in LTM then the following associative retrieval of information will be constrained by the available pattern of links. Thus by presenting appropriate stimuli and examining how students associate these with each other, one might be able to map a defined area of their conceptual structure. Three methods build directly on this idea. All three start with an analysis of the domain under consideration in order to determine a set of key concepts. These key concepts then form the stimuli between which associative links are mapped. The three varieties are (Shavelson, 1975; Preece, 1976):

1. ***Word associations***. The key concepts are used as stimuli for associative recall. On the basis of recall patterns a hierarchical tree of concepts can then be constructed that is assumed to represent conceptual structure in the domain.

2. ***Card sorting techniques***. Students get a set of cards on which the key concepts are printed. They are then asked to sort these cards into categories of concepts that are closely related. The result of their sorting is again a hierarchical scheme of concepts.

3. The third of these approaches is ***graph building*** or ***conceptual mapping***. Related techniques involve ordered tree construction (Naveh-Benjamin et al., 1986). Students are asked to construct a graph or map on the basis of a list of key concepts.

Representations of cognitive structure for a whole group of students can be obtained through ***hierarchical clustering analysis*** (Moreira & Santos, 1981; Shavelson, 1975).

Related methods take into account the precise nature of the links between concepts. They are similar to the techniques above, but based on propositions reflecting these links. This results in more meaningful, but also much more complex, patterns. It is possible to integrate a detailed analysis of knowledge as represented in course content with an assessment of student conceptual structure (Donald & Nagy, 1983). Some methods focus entirely on the representation of domain knowledge (e.g., Garb, 1986).

Raven (1985) employed analyses of verbal and figural student concept schemes through aspects of differentiation (number of categories employed), discrimination (range of phenomena involved), and integration (efficiency of organizing method). More interpretative methods make use of analysis of ***clinical interviews*** or ***written definitions*** (Marton, 1981, 1983; Marton, Hounsell, & Entwistle, 1984; Pines et al., 1978; Sutton, 1980). See also assessment procedures for alternative conceptions.

Another possibility is to have subjects ***rate concepts*** on a number of dimensions (e.g., bad-good, weak-powerful). This makes it possible to locate concepts in a "semantic space" (Sutton, 1980).

Other approaches have emerged that make use of computer languages as expressions of a structure. Such structures can be constructed by the experimenter (Novak, 1982), or subjects engage in building their own "expert system" in a certain content domain, using the PROLOG programming language (Law, 1988).

Issues for Construct Validation:

1. Shavelson (1975) states as an underlying assumption about the use of the methods he discusses that instruction should result in a close correspondence between conceptual structure and content structure. It is far from clear why this should be the case (Stewart,

1979). Possibly word association procedures and similar methods simply reflect how well a student is aware of the structure of the domain without revealing what knowledge organization in LTM really looks like. This does not necessarily deny the use and potential validity of the assessments, but the term "conceptual structure" would then be a misnomer.

2. Barsalou (1983) argues that the concepts we use do not reside in LTM at all. They get constructed in a certain context, as needed. If this is the case then conceptual structures as we can measure them tell us more about the ability of a subject to construct a pattern of relationships than about the organization of LTM.

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Title: ALTERNATIVE CONCEPTIONS

Definition: Alternative conceptions are students' conceptions about the world that differ from accepted scientific understanding (Hills, 1989). There are several synonyms and overlapping terms: alternative frameworks; alternative theories; intuitive conceptions; misconceptions; preconceptions; prior conceptions; naive theories; untutored beliefs.

Related Constructs: Cognitive Structure, Conceptual Structure, Mental Models.

Theoretical Base:

Studies of science conceptions go back to Piaget's studies of children's conceptions of the world (Piaget, 1929). The emphasis by Ausubel, Novak, and Hanesian (1978) on the role of prior knowledge in science learning spurred further research on individuals' existing conceptions.

Over the last decade there has been a growing recognition that students have conceptions about the subject matter that differ from ideas accepted by the scientific community. Such alternative views may be held by the students prior to any instruction (Hills, 1989). Many studies have found that these conceptions tend to persist in spite of instruction (Eylon & Linn, 1988)

Rather than being an unrelated collection of false beliefs, prior notions of students form coherent systems of ideas (Hashweh, 1988; Hills, 1989). Sometimes these systems may be retained and defended with considerable emotional support. In each domain, a limited set of alternative conceptions can be identified that are common among many students (Hashweh, 1988).

Two general approaches to research about student conceptions can be distinguished. Research designed to uncover "misconceptions" aims at comparing students' conceptions with accepted scientific views. Instructional implications drawn from such research are stated in terms of remediation (e.g., Griffiths, Thomey, Cooke, & Normore, 1988). Research according to the second approach attempts to construe students' prior belief systems as rudimentary scientific theories. Here the instructional implications are to strive for a gradual process of conceptual change in which the students are persuaded to abandon their "naive ideas" in favor of views the researchers deem more acceptable (e.g., Posner & Gerzog, 1982). Although researchers working in this tradition define the students' ideas as "alternative," rather than as defective, the implication is that the prior notions of students are inferior to the scientifically accepted ones and in need of change (Hills, 1989).

Research on alternative conceptions has focused largely on science education. There is related work on misconceptions in mathematics which focuses on the incorrect application of procedures by students in algebraic manipulations (Sleeman, 1986).

Alternative conceptions often parallel prior theories from the history of science (Hashweh, 1988; Strauss, 1988). Examples are students' beliefs about force and motion resembling medieval impetus theory (McCloskey, 1983), or about heat and temperature reminiscent of the caloric theory of heat (Wiser, 1988). The nature and extent of students' science conceptions have been shown to interact positively and negatively with school science learning. The observation that there are a finite number of these alternative conceptions which are common among students (rather than an infinite number of idiosyncratic conceptions) makes it feasible to investigate the character and cause of alternative conceptions in order to improve science education.

Assessment Procedures:

1. ***Clinical or Structured Interviews*** (Nussbaum & Novak, 1976); Interview about Instances (e.g., demonstrations, diagrams, or drawings) (Anderson, 1988; Gilbert, Watts, & Osborne, 1985; Piaget, 1929; Posner, & Gertzog, 1982; White, 1985).

2. ***Group Tests.*** (Champagne, Klopfer, DeSena, & Squires, 1980); Multiple-Choice Instruments constructed from Interview data (Anderson, 1988; Arnaudin, & Mintzes, 1985; Nussbaum, 1979).

3. ***Think Aloud Protocols of Problem-Solving*** (Gentner, & Stevens, 1983). (See also assessment procedures for conceptual structure.)

Issues for Construct Validation:

1. How systematically and meticulously have the interviewing techniques been developed and evaluated? Are these methods generalizable?

2. Posner & Gertzog (Posner et al., 1982) provide a discussion of the issues inherent in eliciting the child's knowledge without inducing suggested convictions and interpreting the child's responses.

3. Hashweh (1988) argues that most descriptive studies of students' conceptions in science lack validity. Using certain tasks the researcher constructs a model of or a theory about the students' knowledge. Thus the researcher doing descriptive research is actually engaged in hypothesis formulation and testing. However, the testing is done on the same data used to formulate the model. Hence there is a need for a formal validation phase to assess construct validity of the model. Studies that focus purely on the detection of misconceptions do not have this problem since they apply accepted scientific notions as criteria.

4. To what extent can studies of students' conceptions in science be generalized across populations?

5. Some work has been done on student conceptions in science in a non western society (Adeniyi, 1989). Some of the misconceptions identified are similar to ones found among western students. It would be interesting to have more data on the generalizability across very different groups of the finding of a limited number of common alternative conceptions.

6. What are the uses for knowledge of alternative conceptions and how does that influence ways of characterizing and assessing them? What roles do beliefs, epistemology, and situation play in assessing, developing, and sustaining alternative conceptions?

7. Little is known about the origins of preconceptions. The prevailing view seems to be that students develop these ideas on their own, through an unsophisticated version of scientific reasoning. This would imply that alternative frameworks and scientific theories can be placed on one continuum. Hills (1989) points out that we have no evidence for that. He argues that students' "untutored views" are more likely to stem from commonsense theories our culture provides in domains which are of practical relevance for everyday life. If this is so, then instead of being alternative versions of scientific theories, prior frameworks would be adaptive in their own right and useful alternatives to scientific theories. Attempts to modify them would be inappropriate. Instead teachers should try to involve the students in negotiations about the boundaries between science and common sense, recognizing the merits of each.

8. According to Hills, a valid approach to students' alternative conceptions would imply that first efforts should be directed toward describing the role that pupils' views play in everyday practical contexts, and in the broader framework of their beliefs about the natural world. Such descriptions would then shed light on whether the merits of scientific theory and those of commonsense theory can properly be evaluated by appeal to the same criteria (Hills, 1989).

9. To what extent are alternative conceptions the result of developmental inability to integrate conceptions in a systematic way as opposed to lack of knowledge about the conceptions and the way they relate to each other?

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Example Study Abstracts:

1. Nussbaum, J., & Sharoni, D.N. (1983). Changes in second grade children's preconceptions about the Earth as a cosmic body resulting from a short series of audio-tutorial lessons. *Science Education, 67*, 99-114.

   Tested Ausubel/Novak hypothesis that primary grade students can learn meaningfully certain aspects of science concepts in the "reception learning" model. Revised audio-tutorial instruction unit on earth based on understanding children's misconceptions; assessed impact of revised units with second graders; and compared results to concept development of older students using traditional materials.

2. Gilbert, J.K. (1983). *Alternative conceptions: Which way now?* Paper presented at the annual meeting of the American Association of Physics Teachers, New York, January.

   The study of alternative conceptions, or interpretations of ideas which differ significantly from the accepted scientific view at any time, has made rapid progress in the last few years. A detailed review of the field is not provided; rather achievements made and challenges for the future are noted. Areas addressed include: (1) the elucidation of alternative conceptions, discussing research methodology, need to produce diagnostic tests, and major content focus (mechanics and dynamics) in alternative conception studies; (2) conceptual development in physics; (3) approaches to developing conceptions in the classroom, indicating a key activity to be the generation of cognitive conflict in the individual student; (4) curriculum design; and (5) teacher education. It is noted that researchers in the alternative conceptions field have data which show that some trainee physics teachers have similar conceptions to those of 12-year-olds. Therefore, it is suggested that the training of physics teachers should include ample time for the trainees to articulate, confront, and modify their own alternative conceptions. In so doing they will be subject to the same treatment that they will be encouraged to give to their students.

3. Posner, G.J., & Gertzog, W.A. (1982). The clinical interview and the measurement of conceptual change. *Science Education, 66*, 195-209.

Discusses the use of the clinical interview in assessing cognitive structure and in investigating conceptual change. They caution much more work is needed to increase the applicability and validity of the clinical interview method and point out that there is a lack of systematization in the analysis of interview transcripts.

4. Rogan, J.M. (1988). Development of a conceptual framework of heat. *Science Education, 72*, 103-13

Considers variables which affect the acquisition of the kinetic theory of heat by children who hold alternative viewpoints. Suggests that the articulation of different viewpoints in no way hinders the acquisition of the desired conceptual framework. Emphasizes the benefit to low-reasoning students in particular. (CW)

Title: QUALITATIVE COGNITIVE CHANGE

Definition: A qualitative cognitive change is a shift in declarative or procedural knowledge structure that cannot be accounted for by quantitative changes to a single structure. Qualitative shifts in conceptual structure or learning strategy have been documented by research cited under previous entries. The present entry concerns computer-based assessment designs for this purpose. Intelligent tutoring systems which employ progressions of qualitative models and strategies for solving problems can be used to train persons on those problems. They can also be used to assess students' mental models of the domain, strategies for learning in it, and changes in those across experience with the system.

Theoretical Base:

The heart of the system is a space of qualitative models related to each other by the model transformations which must occur to traverse from one model to the next. These transformations can be viewed as conceptual changes. The target model has been developed from studies of an expert teacher and troubleshooter. The runnable models can be used to generate and solve problems as well as generate explanations of the principles and strategies employed in the problem solving process. Most models in the model space are limited in the complexity of the problems they can solve. Less complex models can only solve less complex problems.

Assessment Procedures:

At any given state of learning, a student's model is inferred from the problems the student can solve (as well as the steps the student uses in the solution). A student is considered to have the least sophisticated model which is capable of solving that problem. The student model consists of a list of the models needed to account for the student's success of solving particular problems. This qualitative change through the space is documented by the progression of models needed to describe the full sequence of student performance through instruction.

Issues for Construct Validation:

1. The expert model is often based on one expert (White & Frederiksen, 1986). Do all experts function in the same way in the domain? Do other experts agree with the models and strategies implemented in the system (Lesgold, 1988)

2. How does the system place students initially in the model space? How many problems are considered sufficient evidence of mastery of a model? What confidence limits apply?

3. Is the approach limited to well-structured domains? How would it work with ill-structured domains?

4. How are student's misconceptions and alternative conceptions treated?

5. How well does the system predict success in real problem solving in this domain?

6. How do the assessments correlate with other measures of understanding in this domain?

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